

# modern machine shop

SEAM WELDING  
GOES  
BIG TIME

See Page 136

HOW TO MAKE  
PRECISION  
TUBE BENDS

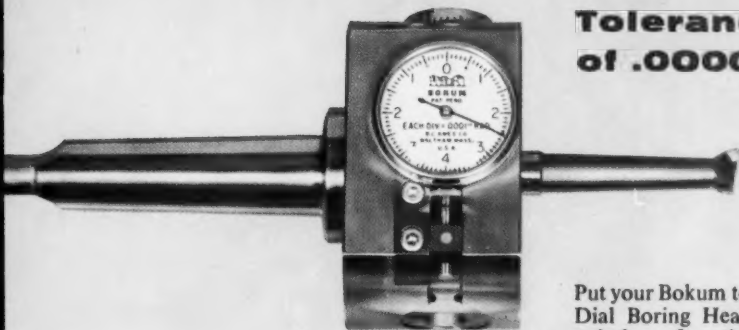
See Page 152

MAY 1960

# NOW



**Tolerance  
of .000050"**



Put your Bokum tool in the Bokumicro-Dial Boring Head\*. For set-up, bore a hole a few thousandths undersize. Measure the hole and move the dial indicator (which moves the tool) to the exact reading you wish—you can read directly 50 millionths of an inch! You get absolute accuracy on production runs or tool room work. It's Bokumagic! Write today.

**BOKUM TOOL CO., INC.**



**14775 WILDEMERE AVENUE  
DETROIT 38, MICHIGAN**

\*PATENT PENDING



## THE OTHER SIDE OF THE MOON?

When earthlings step out on the other side of the moon, they needn't be surprised — American Drill Jig Bushings are available everywhere!

Shown below are American's Hex-A-Groove, Therm-A-Grip and Hex-A-Grip. For information on these and other bushings for Plastic Tooling, write:

*American*

DRILL BUSHING CO.

5107 Pacific Blvd. • Los Angeles 58, Calif. • LUdlow 3-6551 TEL. LA 1315



WORLD'S LARGEST INVENTORY OF PRECISION DRILL JIG BUSHINGS

For more data circle 302 on Postpaid Card



M. L. Forney, *Publisher*  
 Richard S. Kline, *General Manager*  
 Fred W. Vogel, *Editor*  
 Robert I. Shore, *Managing Editor*  
 L. L. Baldhoff, *New Equipment Editor*  
 M. C. Due, *Editorial Assistant*  
 Gilbert C. Close, *Field Editor*  
 Alfred M. Cooper, *Contributing Editor*  
 Norman S. Rogers, *Art Editor*  
 Howard Campbell, *Editor Emeritus*  
 K. M. Gettelman, *Circulation Manager*

# modern machine shop

The  
Idea-Full  
Magazine

## contents

### FEATURES IN THIS ISSUE

Vol. 32, No. 12, May, 1960

<b>Numerical Control</b>	TAPE CONTROL OF MANUFACTURING PROCESSES.....	124
	By M. H. Sluis	
<b>Heat Treating</b>	HOW TO HEAT-TREAT THIN-GAUGE ALUMINUM.....	134
<b>Welding</b>	SEAM WELDING GOES BIG TIME.....	136
	By Gilbert C. Close	
<b>Control Systems</b>	A MACHINE INDEX COMPATIBLE WITH TAB SYSTEM.....	140
	By George Clayton Field	
<b>Hydraulics</b>	HYDRAULIC PRESSURE AIDS PRECISION TUBE BENDING.....	152
	By H. W. Bradstreet	
<b>Management</b>	GUEST EDITORIAL.....	160
	By Alfred M. Cooper	
<b>Die Design</b>	INEXPENSIVE DRAWING DIE.....	176
	By Ira S. Roberts	
<b>Machine Maintenance</b>	JET ENGINE OVERHAUL.....	178
<b>Trade Show</b>	PROGRAM TRIPLE INDUSTRIAL SUPPLY CONVENTION.....	182
<b>Tool Systems</b>	TOOL TRAY FOR TURRET LATHE.....	184
	By H. J. Gerber	
<b>Jigs</b>	SHAFT CENTER LOCATING DEVICES.....	184
	By Clint McLaughlin	
<b>Gaging</b>	GAGE FOR CHECKING TAPER.....	186
	By Harold Sedlik	

### DEPARTMENTS

IMPORTANT MEETING DATES.....	54	FREE LITERATURE.....	188
ADVERTISING REPRESENTATIVES.....	116	NEWS OF THE INDUSTRY.....	206
OVER THE EDITOR'S DESK.....	117	NEW EQUIPMENT.....	220
REPORT FROM WASHINGTON.....	120	WHERE TO GET IT.....	322
IDEAS FROM READERS.....	184	INDEX TO ADVERTISEMENTS.....	332



Member

**BPA**

#### A Statement of Policy

The principal function of MODERN MACHINE SHOP is to search out and disseminate the best and newest ideas for the advancement of engineering skill and mechanical efficiency in the metalworking industry, and neither effort nor expense is, or shall be, spared in the performance of this task.

## TAPE CONTROL OF MANUFACTURING PROCESSES

**By M. H. Sluis**

Project Engineer Sluis emphasizes the fact that manufacturers who hope to keep production in line with demand must study carefully the economic advantages of automatic control of machining operations. A number of interesting illustrations supplement his discussion.



**Page 124**

## HOW TO HEAT-TREAT THIN-GAUGE ALUMINUM WITHOUT DISTORTION

Specially developed space springs solve distortion problem in heat treating aluminum sheets ten to sixty thousandths inch thick.

**Page 134**

## SEAM WELDING GOES BIG TIME

**By Gilbert C. Close**

Huge butt welder will handle cylindrical shapes of a diameter limited only by the distance to the plant roof above the welder's location.

**Page 136**

## HOW TO MAKE A MACHINE INDEX COMPATIBLE WITH TAB SYSTEM

**By George Clayton Field**

Machine indexing provides a guide to economy, for use of equipment and machines, commensurate with the size and capacity of your business.

**Page 140**

# in this issue

VOL. 32 • NO. 12

modern machine shop

## HYDRAULIC PRESSURE AIDS PRECISION TUBE BENDING

**By H. W. Bradstreet**

Author describes an unusual bending process used at Douglas Aircraft's Long Beach, California, Division which is designed to assure the production of high precision bends in stainless steel tubing with a minimum number of rejects.

**Page 152**

## GUEST EDITORIAL

**By Alfred M. Cooper**

"A crucial year begins our most crucial decade," so emphasizes MMS Contributing Editor Cooper in this very timely editorial.

**Page 160**

## INEXPENSIVE DRAWING DIE

**By Ira S. Roberts**

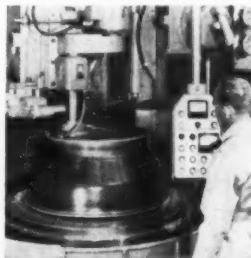
A unique die, designed for producing steel piling bottom caps, is made by arc weld surfacing mild steel with a semi-austenetic deposit.

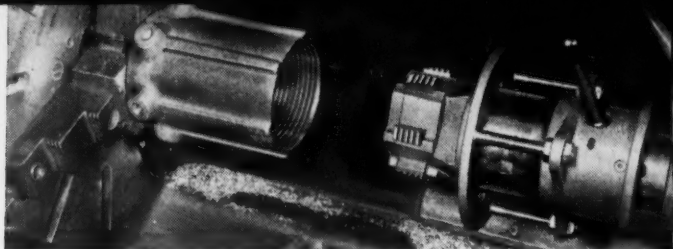
**Page 176**

## JET ENGINE OVERHAUL

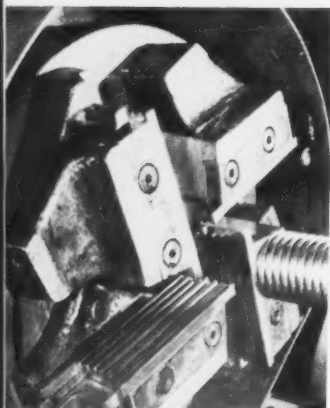
A new type of vertical machine, capable of performing a variety of grinding, boring, facing, turning and associated operations, is revolutionizing the overhauling of jet engines at United Air Lines' new maintenance base located at South San Francisco, California.

**Page 178**





*the world's largest selection of*  
**thread cutting tools**



THREADING EFFICIENCY requires the selection of the proper Thread Cutting Tool, and is the essence of Landis design. To insure that you may use the most efficient threading tool, Landis manufactures the world's largest selection of Thread Cutting Tools . . . both internal and external.

**DIE HEADS** . . . Heat-Treated types for economy, Hardened and Ground types for precision threading, Solid Adjustable Heads for reversing spindle machines . . . ranges from  $\frac{1}{8}$ " to  $9\frac{1}{4}$ ".

**TAPS** . . . ALT Collapsible for parallel tapping, LL Receding Chaser Collapsing for taper threads, Non-Collapsing Solid Adjustable for reversing-spindle machines . . . ranges from  $1\frac{1}{4}$ " to 24".

**CHASERS** . . . all Landis Die Heads and Taps use Landis Chasers which produce a high degree of thread finish and maximum number of pieces between grinds.

The constant research for better threading methods, which has brought to Landis leadership in its field today, plays an even more important part in our activities. We offer all manufacturers our over 50 years experience in all phases of Threading. May we help you?

For more data circle 315 on Postpaid Card

**LANDIS Machine COMPANY**

WAYNESBORO • PENNSYLVANIA

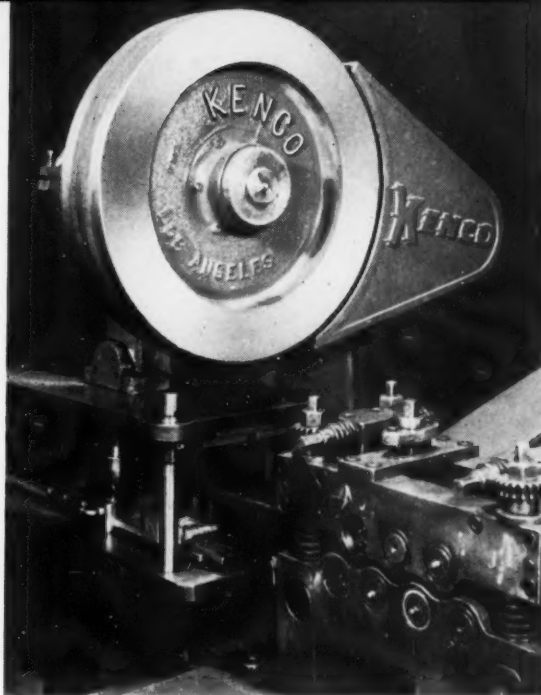


BOOTH NO. 432

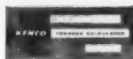
# KENCO press doubles production of cut strip...saves 71% in equipment cost

● Rolled Steel Products Corp. of Los Angeles uses a Kenco 15 Ton Press to cut coil strip automatically into various lengths—up to 25 feet long. The press is equipped with a Kenco Cyclo-Safe Clutch which is designed to permit precise synchronizing with the Press Controls and respond instantly to Control signals. These Cyclo-Safe features make it possible to cut strip into accurate lengths at high production, using continuous coil feed through a sliding die.

● This Kenco setup eliminates for more expensive equipment normally used in automatic cut-off operations, saving 71% in equipment investment. At the same time, production has been doubled compared to the former method using a press with a conventional clutch while improving accuracy of cut lengths.

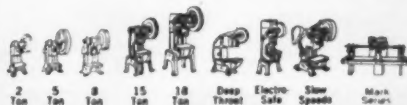


KENCO Presses feature extra long ram guides assuring accurate closure and long die life. Frames are stronger for a rated tonnage because they are made of fine grain Sorbitic castings processed to eliminate internal strains. The flywheel runs on double roller bearings.



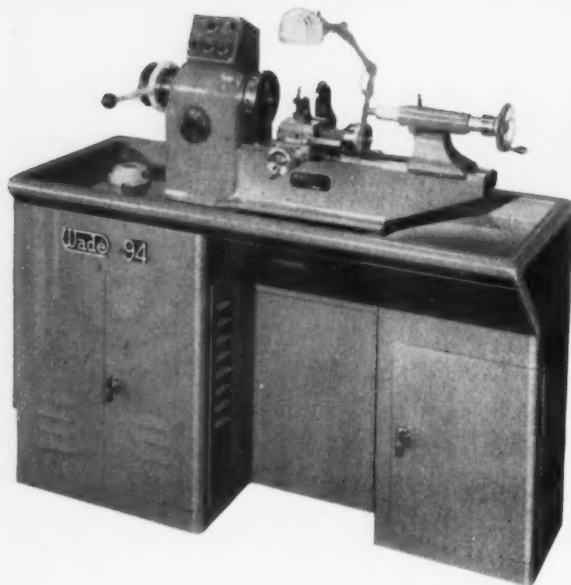
Press Tonnage Calculator - Free on request.

Write for Kenco literature giving complete press specifications.



THE MOST COMPLETE LINE OF SMALL PUNCH PRESSES IN THE WORLD

For more data circle 316 on Postpaid Card



*Cut toolmaking costs  
with a **Wade**  
#94 FINISHING LATHE*

Every design feature built into the Wade Finishing Lathe has one aim in view: to make this machine the *most convenient and the fastest to use* for toolmaking and limited production. The Wade Model #94 has a 9" swing, 1-1/16" collet capacity and will accept 15" between centers.

*Write for literature.*

Sold by Pratt and Whitney Co., Inc. in most areas.

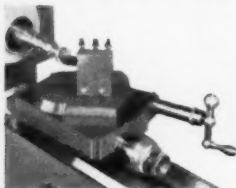
**THE WADE TOOL CO.**

WALTHAM 54, MASS., U.S.A.

MAKERS OF  
PRECISION MACHINE TOOLS  
FOR AMERICAN INDUSTRY

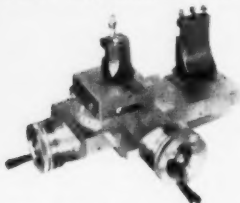
For more data circle 317 on Postpaid Card

**SOME OF THE MANY  
COST-SAVING FEATURES**



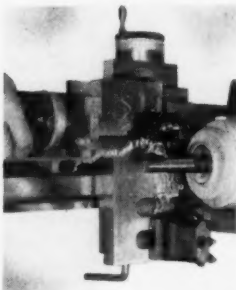
**RADIUS TURNING  
ATTACHMENT**

Concave and convex surfaces are readily generated after a simple set-up with a direct-reading dial indicator. Worm gear feeding insures a finely controlled finish.



**REAR SLIDE CUT-OFF**

The rear tool station is an added feature to the traditional convenience and accuracy of the Wade Super Slide Rest. A cut-off tool may be left in readiness to avoid tool changing.

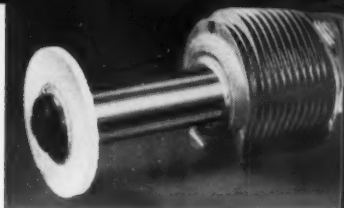
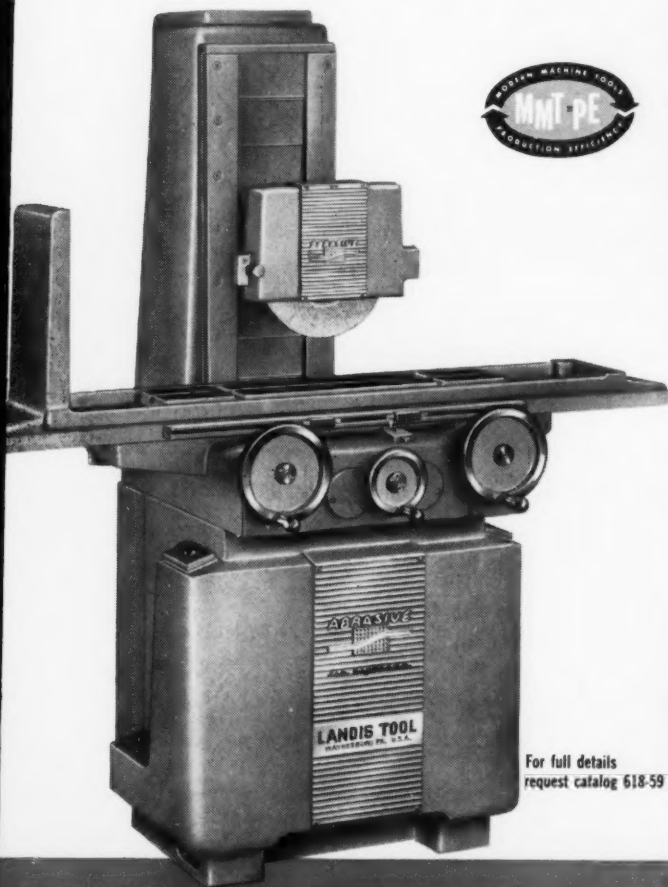


**DIRECT READING DIALS**

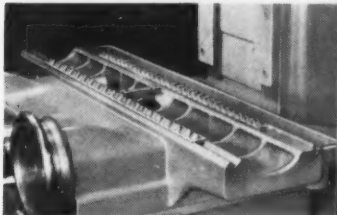
Large satin-chrome dials read directly in thousandths of an inch and are resettable to zero.

For the best buy  
in high precision  
surface grinders

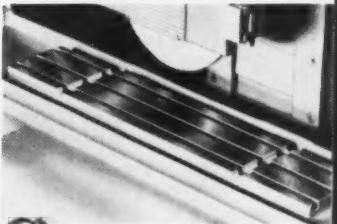
**Landis Abrasive 618—built to  
Landis precision grinder standards**



**Accuracy with Heavy Stock Removal**—Unit motorized spindle, dynamically balanced. Supported by two super precision preloaded bearings at each end.



**Accurate Slot and Shoulder Grinding**—Roller bearing ways with backlash eliminator on saddle assure positive accuracy.



**Close Tolerances**—Heavily ribbed table, extra thick saddle and widely spaced ways assure accuracy even under overload conditions.



**Sensitive Precision Controls**—Feed increments of .0001" on head. Crossfeed graduated in .001" with adjustable vernier in .0001".

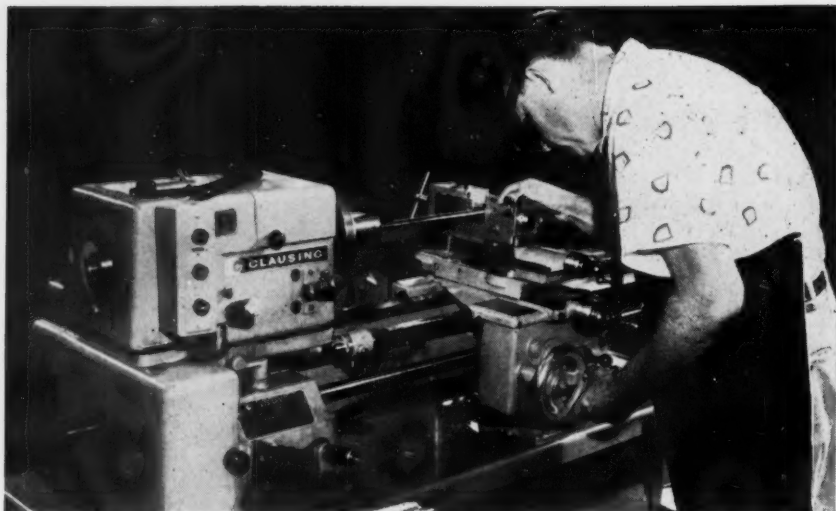
For full details  
request catalog 618-59

**ABRASIVE**  
precision surface grinders

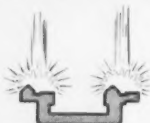
a product of  
**LANDIS TOOL**

world's largest manufacturer of  
precision grinding machinery  
**WAYNESBORO, PENNSYLVANIA**

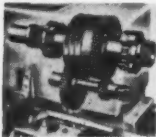




**"For stamina, ease of operation, and ability to repeat to close tolerance Clausing 12 3/4" lathes lead their field"**



**FLAME HARDENED BED WAYS**—a long-service-life feature that is standard equipment at no extra cost.



**TIMKEN "ZERO-PRECISION" TAPERED ROLLER BEARINGS** assure precision performance and long accuracy life.

This statement, by FREQUENCY STANDARDS of New Shrewsbury, New Jersey, is typical of user reports on CLAUSING 5400-Series lathes. And no wonder, no lathes at or near CLAUSING'S low prices give you so many **QUALITY** features. Here are just a few of them:

- **SHAVED GEARS** . . . an exclusive that assures greater accuracy.
- **FLAME HARDENED, PRECISION GROUND BED WAYS** **STANDARD EQUIPMENT** . . . a feature that costs many dollars more with other lathes in this class.
- **BIG FORGED STEEL SPINDLE WITH HARDENED GROUND NOSE** . . . 1 3/4" bore . . . 1" collet capacity.
- **TIMKEN "ZERO PRECISION" TAPERED ROLLER BEARINGS.**
- **CHOICE OF VARIABLE-SPEED OR 10 SPEED BALL BEARING COUNTERSHAFT** . . . with clutch and brake optional.
- **VERIFIED ACCURACY** . . . factory test report accompanies each lathe.

Get *all* the facts and compare. When you have, we are confident you, too, will agree that "for stamina, ease of operation, ability to repeat to close tolerance and all around *value*, CLAUSING 5400-Series lathes lead their field by a wide margin." Write, today, for complete information.

**PRICES START AT \$1120 F.O.B. FACTORY**

SEE US AT BOOTH 1931  
A.S.T.E. SHOW, DETROIT



**CLAUSING DIVISION**

**ATLAS PRESS COMPANY**

**5-110 N. Pitcher St. • Kalamazoo, Mich.**

For more data circle 318 on Postpaid Card

# Librascope Buys 16 Burgmaster Bench Model Turret Drills... steps up production

## 400%

The Librascope Division, General Precision Controls Inc. is making record savings with Burgmaster Bench Model "O" Turret Drills. After an original purchase of two machines, consistent savings in machining precision parts led to further purchases totaling 16 Burgmaster Machines.

Gear Shaft Assemblies for Fire Control Computers were formerly machined with a Single Spindle Drill producing a lot of 15 parts in 2.50 hours. Now the Bench Model Burgmaster produces the same lot in .50 hours, an increase of 400%. Savings like this are possible because POWER INDEXING of the turret rapidly performs up to six operations at operator command without tool changing and with minimum operator exertion and fixture shifting. Each spindle controlled by preselective speed and depth control.

Write for Literature—dealers in principal industrial centers.



World's largest manufacturer of turret-type drilling and tapping machines.

### **BURGMASER CORPORATION**

SMALL TOOL DIVISION—BURG TOOL MANUFACTURING CO., INC.

15001 S. Figueroa St., Box 311, Gardena, Calif. • Phone: FAcultry 1-3510—Phone, wire or write Dept. G.

For more data circle 319 on Postpaid Card



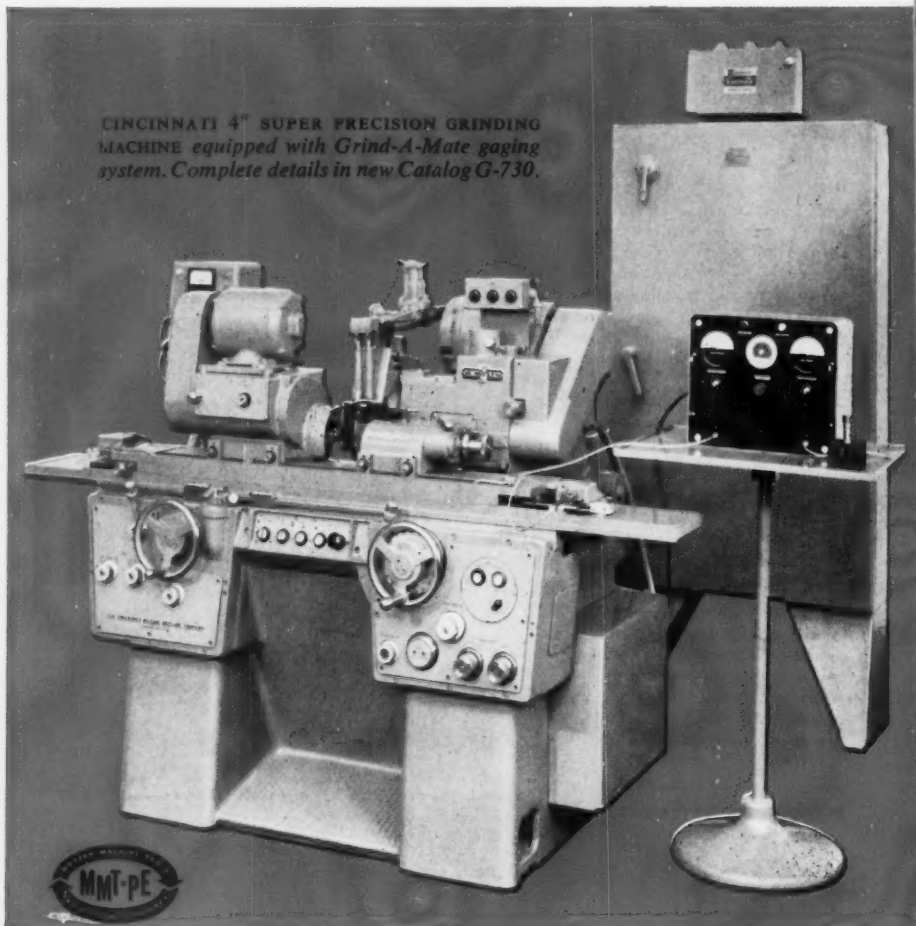
Bench Model "O"—Price \$595.00 FOB Los Angeles  
Speed ranges from 350 to 6200 rpm— $\frac{1}{4}$ " drill  
and tap capacity in steel— $\frac{1}{2}$  h.p.

See us at the National ATSME Show Booth 734,  
Detroit, Michigan.

# New CINCINNATI

## 4" Super Precision

CINCINNATI 4" SUPER PRECISION GRINDING MACHINE equipped with Grind-A-Mate gaging system. Complete details in new Catalog G-730.



BUILDERS OF PRECISION GRINDING MACHINES: CENTERTYPE • CENTERLESS • MICRO-CENTRIC  
THE CINCINNATI MILLING MACHINE CO., CINCINNATI 9, OHIO



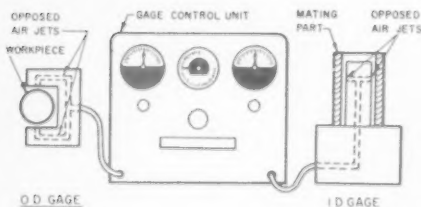
# Grinder gives you ultra-high accuracy in matched grinding

HERE IS A MACHINE designed and constructed for just one purpose . . . ultra-precision grinding. The new CINCINNATI 4" Super Precision Grinder attains tolerances for size, roundness, straightness and surface finish *within a few millionths of an inch*, on a semi-automatic production basis. This extreme accuracy has many applications for matched-hole grinding of critical parts, such as missile control valves, fuel injector plungers, and a variety of other mating parts.

For maximum stability the new 4" Super Precision Grinder incorporates heavy duty castings with extra ribbing. All alignments and center

heights are held to tolerances approaching the vanishing point. Motors are super balanced, and both cutting fluid and hydraulic tanks are isolated from the machine to eliminate vibration. A special dual rate automatic infeed unit provides rates as low as .0002" per minute. Cincinnati's Gage-Line unit assures extremely accurate taper adjustment, without trial and error or bothersome calculations; temperature and foot-stock tension adjustment are regulated with equal precision.

Our Grinding specialists will be glad to provide further information. Specifications may be obtained by writing for new Catalog G-730.



AUTOMATIC GRINDING OF MATING PARTS is completely controlled by Cincinnati's exclusive Grind-A-Mate Gaging System (left). Air jet gages continuously measure both the OD of workpiece and ID of mating part, and workpiece is precisely ground to desired clearance.

## CINCINNATI®

GRINDING MACHINE DIVISION

• ROLL • CHUCKING • CENTERLESS LAPPING

For more data circle 320 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 11

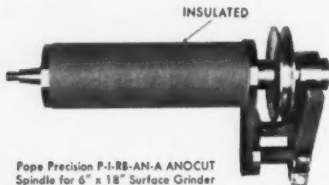
# For Fast Removal Of Tough Metals Specify **POPE** PRECISION

## ELECTROLYTIC GRINDING ("ANOCUT") SPINDLES

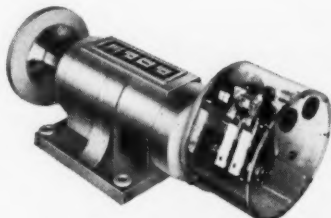
*with total eccentricity of shaft less than fifty millionths (.000050")*

Pope "Anocut" Spindles are available for 50 to 3000 amp. operation, motorized or belt driven with wheels up to 28" dia. They are equipped with built-in insulation and a new Pope rugged fork type, cool operating brush assembly for transmitting low voltage, high amperage current to the wheel.

To get the most production out of electrolytic grinding, you need Pope designed, precision built electrolytic grinding spindles. Let us have your specifications for quotations.



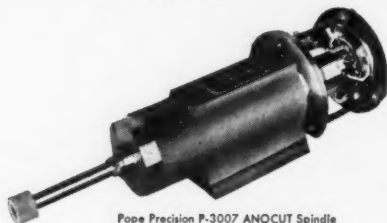
Pope Precision P-1-RS-AN-A ANOCUT Spindle for 6" x 18" Surface Grinder — 300 amps, 5000 RPM.



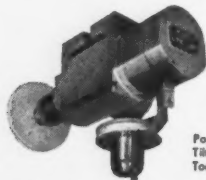
Pope Precision P-19162 ANOCUT Spindle; 1 to 20 HP, 1800 RPM.



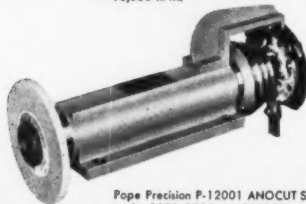
Pope Precision P-19163 ANOCUT Spindle mounted on Pope heavy duty universal slide with indicators for measuring feed in ten-thousandths.



Pope Precision P-3007 ANOCUT Spindle — 10,000 RPM.



Pope Precision P-6651-XG-54 ANOCUT Tilting Head for attaching to Cincinnati #2 Tool and Cutter Grinder.



Pope Precision P-12001 ANOCUT Spindle — for 2000, 3000 and 5000 RPM.

No. 127

# POPE®

**ENGINEERS, DESIGNS AND BUILDS  
PRECISION ANTI-FRICTION BEARING SPINDLES  
FOR EVERY PURPOSE**

**POPE MACHINERY CORPORATION • 261 RIVER STREET • HAVERHILL, MASS.**

*Established 1920*

For more data circle 321 on Postpaid Card

## WHAT'S YOUR BORE-SIZING PROBLEM?

If it's shown here  
—Sunnen Honing  
is your answer!

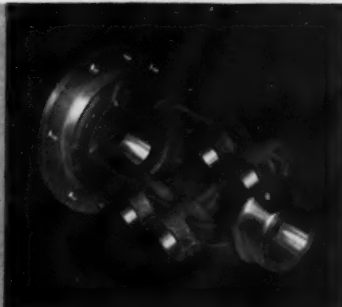


### THIN WALL PARTS

...are quickly sized and finished without bore distortion. No fixtures, no chucking — no "spring back!" Accuracy guaranteed to .0001".

### TANDEM BORES

Sunnen Honing Tools size and finish both tandem bores simultaneously... assure perfect alignment and identical size of both holes.

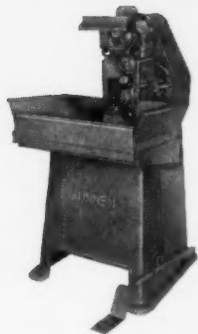


### ASK FOR FREE BOOKLET XSP-5075

... 99 case histories with production rates. Shows versatility, precision, and fast stock removal rate of Sunnen Honing.



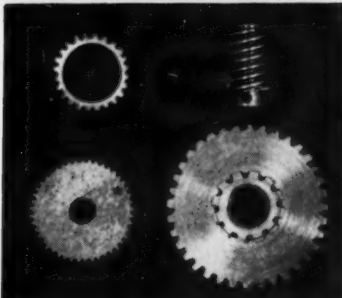
For more data, circle  
322 on Postpaid Card



### AVERAGE COST OF SUNNEN HONING MACHINE WITH TOOLING ONLY \$1,000

Standard tooling range:  
.100" through 2.625" dia.  
Built to order: through  
4½" dia.

8971 A



### BORES IN SMALL PARTS

ID's as small as .100" can be quickly sized and precision finished. Sunnen Honing corrects out-of-round, taper, bow, bell-mouth, barrel, and chatter marks.



### PORTED BORES

... long, self-locating honing tool bridges ports... eliminates edge washout... guarantees geometric straightness and roundness of the bore.

**SUNNEN  
HONING**

SUNNEN PRODUCTS COMPANY

7924 Manchester Ave. • St. Louis 17, Mo.  
Canadian Factory: Chatham, Ontario

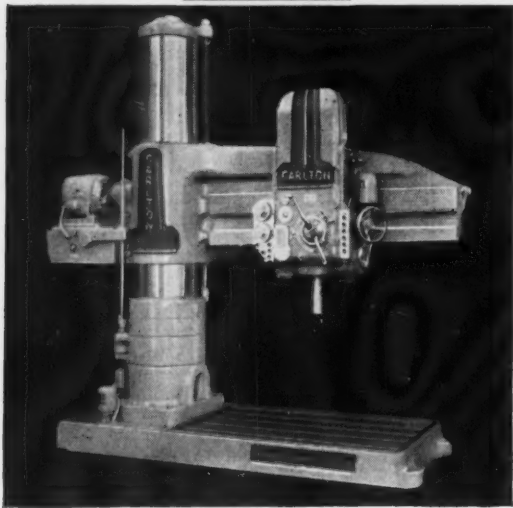


Model	Column diameters	Arm lengths	Speeds No.	Range	Feeds No.	Range	Motor recommended
0A	9"	3'-4"	8	20 to 1	4	.004-.020	3-hp
1A	9" 11"	3'-4" 3'-4'-5'	12	25 to 1	6	.006-.025	5-hp 5 or 7½-hp
3A	12" 15" 17"	4'-5" 4'-5'-6" 5'-6'-7'	36	100 to 1	18	.004-.125*	7½, 10, 15, 20 or 25-hp
4A	19"	6'-7'-8"	36	100 to 1	18	.004-.125*	15 to 40-hp
5A	22" 26"	7' to 10" 8' to 12'	36	100 to 1	18	.004-.125*	20 to 40-hp†

\*8, 11½, 14 and 18 threads per inch are standard, with various other combinations available.  
†Driving motor larger than 40 hp can be used if desired.

*Carlton...the modern design radial drill*

0A 1A 3A 4A 5A



Carlton is the *only* radial drill to bring you all these advantages:

- Low-hung drive to spindle
- All ball bearing construction
- Independent electric power for spindle and all auxiliary components
- Pushbutton control
- 3-unit power clamping
- Precision column clamping

Carlton also offers the widest choice:

- 5 different models
- Column diameters from 9" to 26"; arm lengths from 3-ft. to 12-ft.
- 5 different types of speed-feed controls (on 3A, 4A and 5A)

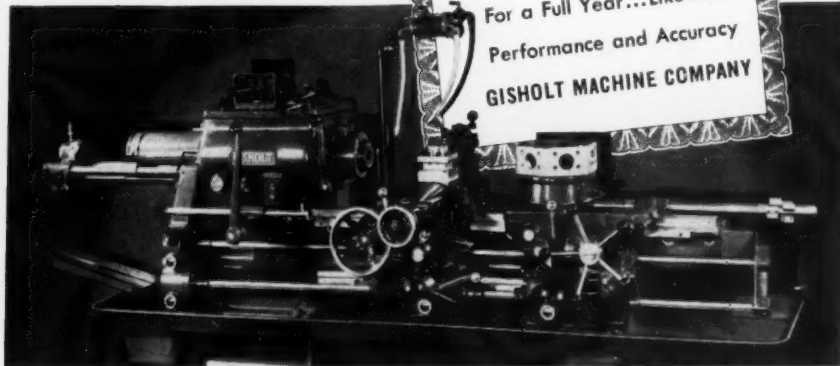
Write today for descriptive bulletins. The Carlton Machine Tool Co., Cincinnati 25, Ohio.

**Carlton** *Specialists in radial drills*

For more data circle 323 on Postpaid Card



Gisholt Factory-Rebuilt 2L  
Saddle Type Turret Lathe



## you can cut your costs with GISHOLT FACTORY-REBUILT LATHES

Is lack of capital forcing you to rely on old, worn-out lathes that slow production, skyrocket costs and up your reject rates? Then here's the answer to your problems. **YOU CAN GET ORIGINAL ACCURACY AND PERFORMANCE** with a Gisholt Factory-Rebuilt Lathe **FOR LITTLE MORE THAN HALF THE COST OF A CURRENT MODEL!**

*Several Plans Are Available*—you can purchase a factory-rebuilt lathe outright, trade in your old Gisholt Lathe as a part of the rebuilt's purchase price, or have your old Gisholt Lathe rebuilt at the factory. You can also take advantage of Gisholt's liberal Time-Payment or Leasing Plans.

*Modern Features Added*—in many cases cost-cutting improvements such as automatic drives for ram type turret lathes, JETracers for ram and saddle type turret lathes and automatic lathes, can be added to your rebuilt lathe for even greater production efficiency.

*Guaranteed by Gisholt*—all Gisholt Rebuilds are guaranteed to equal original performance, accuracy and appearance for a full year—**THE SAME GUARANTEE AS ON BRAND-NEW MODELS!**

Ask your Gisholt Representative or mail the coupon for a free booklet—"Rebuilding Service Makes Old Machines Like New."

**GISHOLT**  
MACHINE COMPANY  
Madison 10, Wisconsin

**Investigate Gisholt's Extended  
Payment and Leasing Plans**

Gisholt Machine Company  
Madison 10, Wisconsin

☐ Please have representative call.

Name.....Title.....

Company.....

Address.....

City.....Zone.....State.....

For more data circle 324 on Postpaid Card

# new

## **GREAVES**

### 2-XH Milling Machines

**more  
power at  
the cutter!**

The completely new GREAVES No. 2-XH Milling Machine brings added versatility, increased operational ease, and more power where it's needed most . . . *at the cutter!*

It utilizes two motors, one for spindle drive; a separate motor for moving table, saddle and knee. Compare this and the other outstanding features of the new Greaves Mill. You'll see why Greaves is "The MOST Mill for the LEAST Money."

*Write for detailed literature!*

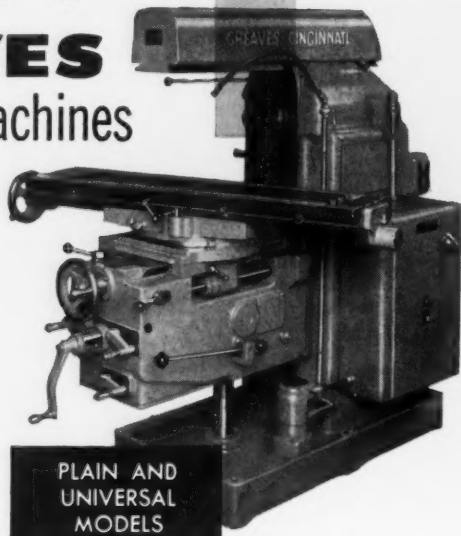
# GREAVES

**MACHINE TOOL DIVISION**

**J. A. FAY & EGAN COMPANY**

2700 Eastern Avenue, Cincinnati 2, Ohio

For more data circle 325 on Postpaid Card



**PLAIN AND  
UNIVERSAL  
MODELS**

- \* Wide range of speed/feed combinations for any type material, any type job.
- \* Heavy, internally ribbed column casting and heavy duty rectangular overarm for maximum rigidity.
- \* Large, heavy-duty knee, saddle and table provide accuracy for all types of milling.
- \* New 7½ HP spindle drive motor, with separate motor for movable components, provides extra power for heavy milling.
- \* Easy-to-reach controls. Handwheels and vertical crank disengage automatically when not in use.
- \* New rapid traverse lever within operating control area.
- \* Separate drive motor for table, saddle and knee provides more smooth balanced power at the cutter.

## MORSE HELPS PUT THE MIGHT IN MACK



**Longer lasting, faster cutting Morse tools give Mack smoother holes...increased production...long-range economy.**

To build the toughest trucks on the road, Mack tooled up with the toughest tools on the market... Morse.

Sound economics? Sure. Longer lasting, more efficient tools *invariably* produce long-run economy.

Tough Morse cutting tools will add long-range economy...and improved performance...to your job, too. For details, contact your Morse-Franchised Distributor today.

# MORSE

means "THE MOST" in Cutting Tools

MORSE TWIST DRILL & MACHINE CO., NEW BEDFORD, MASSACHUSETTS

Warehouses in: NEW YORK • CHICAGO • DETROIT • DALLAS • SAN FRANCISCO



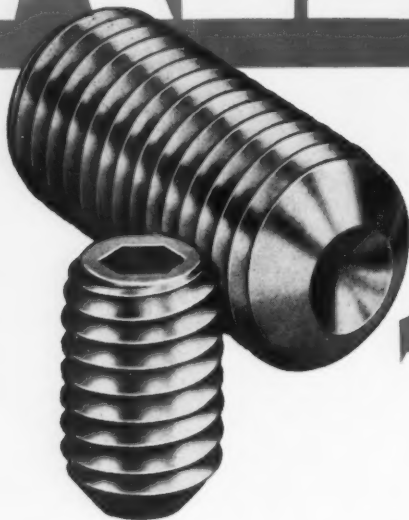
*Morse means more production...smoother, more accurate production...with every type of cutting tool from drills, reamers, taps and dies, to end mills, milling cutters, slitting saws and "specials". So, if you want the best from every cutting tool you buy, mark your order "MORSE". For if you want Morse Quality, there's only one way to get it...specify Morse.*



A Division of VAN NORMAN INDUSTRIES, INC.

For more data circle 326 on Postpaid Card

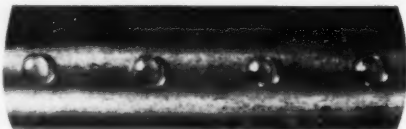
# ALLEN



Allenpoint's deep, full-circle bite assures tremendous resistance to removal torque! Stays tighter longer!

When you need a set screw that you can depend on to stay tight under heavy strain and vibrations, specify ALLENPOINT. For here is a set screw that penetrates deeper, holds *firmer* against dislodging forces. Proper design of the cup diameter assures a rugged grip that makes the full-circle pattern you see below . . . deep,

strong, clean sockets that allow full wrenching leverage. And the Class 3A threads provide a tight friction lock over the entire length of Allenpoint Set Screws.



For more data circle 327 on Postpaid Card

*Ask your ALLEN Distributor for samples and full engineering details—he's always ready, willing and able to give you prompt service from complete stocks.*



## ALLEN MANUFACTURING COMPANY

Hartford 1, Connecticut, U.S.A.

## Start saving money right now on threading jobs like these



**SINK FLANGE - STAINLESS**  
3.341 IN. DIA. 10 TPI  
THREADING TIME - 37 SECONDS



**STUD - TITANIUM**  
.25 IN. DIA. 28 TPI  
THREADING TIME - 20 SECONDS



**FOCUSING NUT - ALUMINUM**  
1 IN. DIA. 16 TPI & START  
THREADING TIME - 25 SECONDS



**BODY - STAINLESS STEEL**  
1.25 IN. DIA. 24 TPI  
THREADING TIME - 7 SECONDS



**WORM - MILD STEEL**  
.9563 IN. DIA. 26 D.P. 8 START  
THREADING TIME - 3 MIN. 20 SECS.



**VALVE STEM - BRASS**  
2 START 10 TPI STUB ACME  
THREADING TIME - 23 SECONDS



**SCROLL - A.I.S.I. 4150**  
500 LEAD  
THREADING TIME - 6 MIN. 13 SECS.



**ADAPTOR - ZINC ALLOY**  
11 TPI INT. 16 TPI EXT. SIMULTANEOUS  
THREADING TIME - 12 SECONDS



**FUEL NOZZLE - AMS-5640**  
1.040 IN. DIA. 12 TPI  
THREADING TIME - 12 SECONDS

### WITH CRI-DAN THREADING LATHES

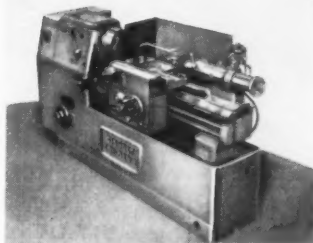
... cut costs with simple single-point carbide tools.  
Eliminate expense of thread milling cutters or thread grinding wheels.

... assure extremely accurate lead and thread form and exceptional finish on materials that don't allow economical threading by other methods.

... handle any material from titanium or toughest alloy steels to brass and other non-ferrous metals with a wide selection of spindle speeds and feeds to meet all job requirements.

... set up fast to produce single- or multiple-start, coarse or fine, left- or right-hand threads, parallel or tapered with metric or inch pitches — thread up to shoulders on all types of internal and external operations.

Why put off the savings the CRI-DAN method can bring you *right now*? Ask your Gisholt Representative for complete details. Or write us for literature or cost estimates on your particular work.



Two models are available. The smaller Model B is shown. Rugged saddle supports fast-acting threading slide, easily positioned along bed. Complete change-over from job to job can be made in 15 minutes.



# GISHOLT

MACHINE COMPANY

Madison 10, Wisconsin

Turret Lathes • Automatic Lathes • Balancers • Superfinishers • Threading Lathes

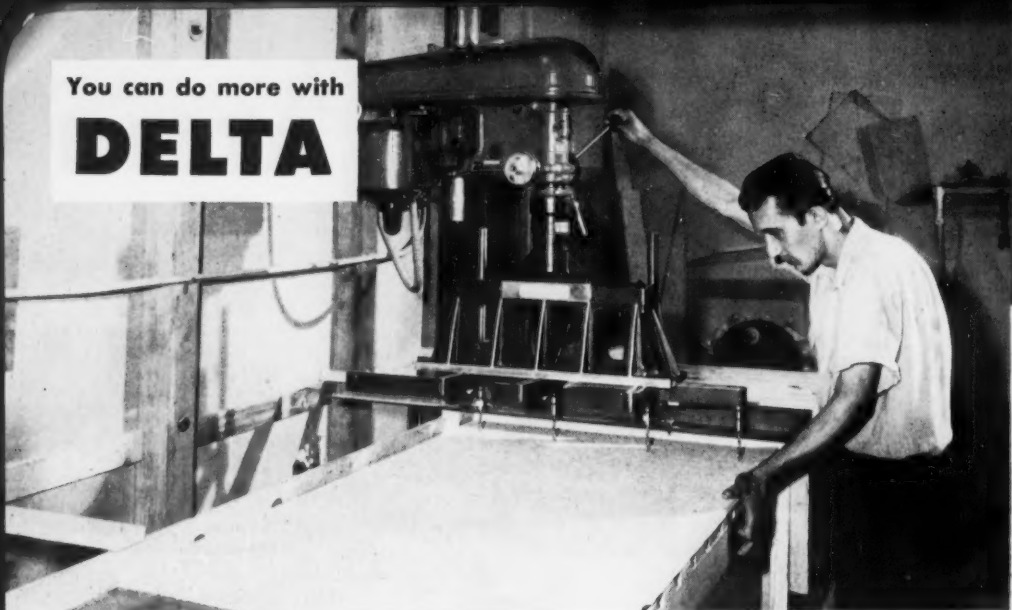
For more data circle 328 on Postpaid Card

Investigate Gisholt's Extended  
Payment and Leasing Plans

Factory-Rebuilt Machines with  
New-Machine Guarantee

You can do more with

# DELTA



## Costs cut 50% in multiple hole drilling



Delta 17" Drill Press, also 20", 15", 14" and 14" Super-Hi Sensitive. Available in floor, bench and multiple-spindle models.

Suspending a 17" Delta drill press from an angle iron wall bracket *doubled* productivity at S & S Visual Co., Brooklyn, N.Y. Multiple spindle drill head permits simultaneous drilling of up to 15 holes in wide panels. Versatile, standard Delta components cut drilling costs in half, yet cost less than \$1000.

Every model in the world's most complete drill press line offers extras in power, precision performance and ruggedness. Delta drill presses give you better value for your money—they cost less to buy, operate and maintain.

See 61 Delta machines, 302 models, over 1400 accessories—visit your Delta Industrial Distributor (listed under "TOOLS" or "Machinery" in the Yellow Pages). For FREE catalog, write: Rockwell Manufacturing Company, Delta Power Tool Division, 606-E N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Guelph, Ont.

DELTA INDUSTRIAL TOOLS

another fine product by

## ROCKWELL



For more data circle 329 on Postpaid Card

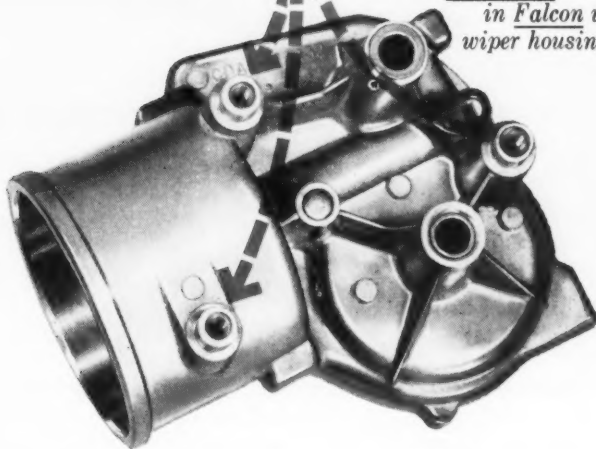


# FORD GAINS 500% IN TOOL LIFE



**BESLY X-PRESS TAPS**  
Speed-form internal threads in metals such as copper, brass, die castings, aluminum, lead, leaded steels and other ductile materials. They are available in standard tap sizes and various styles for through or bottoming holes. Patent No. Re. 24,572. Other patents pending.

*when Besly X-Press® Taps  
speed-form internal threads  
in Falcon windshield  
wiper housing!*



Ford Motor Company's *Falcon* will give you good forward vision in rain, snow or sleet with its powerful windshield wiper.

Besly X-Press Taps, in a Kingsbury 3-spindle machine, tap directly into three cored holes in the Falcon's aluminum die cast windshield wiper housing. Drilling operations were avoided. Production is continuous. The Besly

X-Press Tap produced as high as 50,000 tapped holes before replacement—thus offering increases of approximately 500% in tool life over conventional cutting-type taps. *Speed-forming* makes stronger, burnished internal threads, without cutting. There are no chips to load the tap in bottoming holes such as these. And faster cycling speeds production!

**BESLY**®

Copyright 1960, Besly-Welles Corporation, South Beloit, Illinois, U. S. A.



**BESLY-WELLES CORPORATION**

120 Dearborn Ave., South Beloit, Illinois

Grinders and Abrasives • Taps • X-Press Taps® • Drills • Reamers • End Mills • Tool Bits  
Gages • Carbide Tipped Tools, Blanks, Inserts and Holders

For more data circle 330 on Postpaid Card

May, 1960

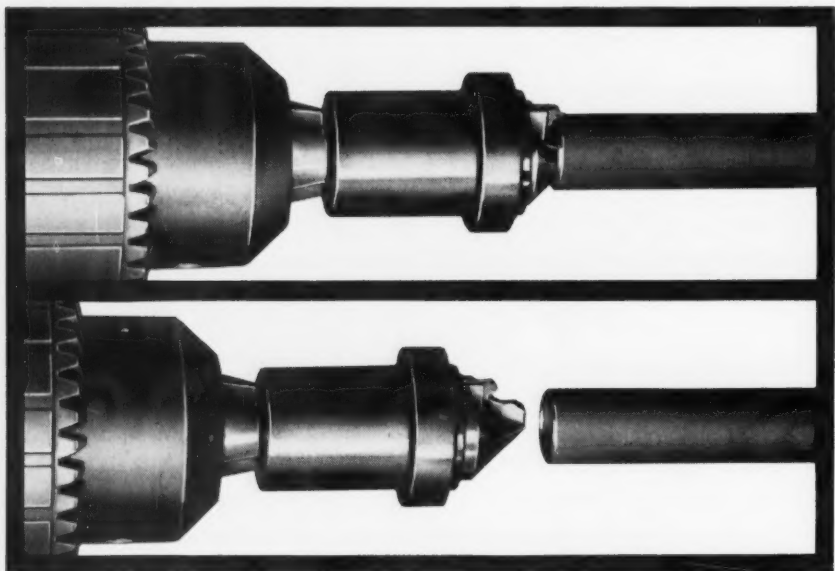
MODERN MACHINE SHOP

21



# NEW!

**TUBURR performs  
3 tube forming operations  
in 1 cycle**



For screw machines, multiple spindle machines, tube finishing machines—a new tool to combine three operations in one. TuBurr chamfers both O.D. and I.D. and faces all in one stroke. Spindle travel toward the tube end automatically centers the cone-shaped carbide tip in the tube. Continued travel retracts the cone in the tool, exposing the blade. Upon release of spindle pressure, the cone retracts to original position out over the blade. Blades are interchangeable, available for any angle chamfer. Each TuBurr covers a range of tubing sizes by change of blades.



*seconds for hole finishing*

## Cogsdill

**TOOL PRODUCTS, INC.**

12976 W. EIGHT MILE RD., OAK PARK 37, MICHIGAN

For more data circle 331 on Postpaid Card



***So what's all the commotion  
about this R-O Universal Form  
relieving Fixture and Grinder?***

***So we've been sharpening tools  
for 30 years without problems—  
Why change?***

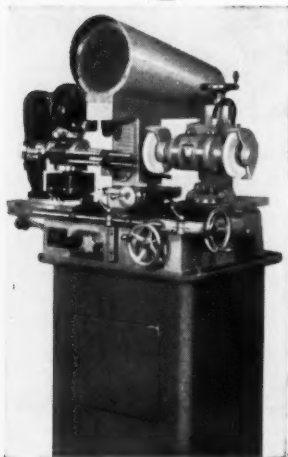


***So it makes a cheap cutter last a  
little longer—Probably costs  
a lot more than it saves!***

***So it makes a tool cut a little cleaner  
—We don't have quality problems—  
We're satisfied with our speeds!***



***So I should spend a lot of money  
when I'm getting by OK?***



Keep talking, mister—your doubts ring a familiar note! But can you hold close step limits. Can you check your tools without disturbing set-up, etc. Get all the facts. Your appraisal may not be fair to yourself. Some of the most enthusiastic users of R-O equipment were doubters first.

**R-O MANUFACTURING COMPANY  
31171 Stephenson Highway,  
Madison Heights, Mich.**

Please forward the R-O catalog

Firm.....

Address.....


City..... Zone..... State.....


Per.....

Title.....


For more data circle 332 on Postpaid Card

## a message to owners of MARVEL HACK SAW MACHINES

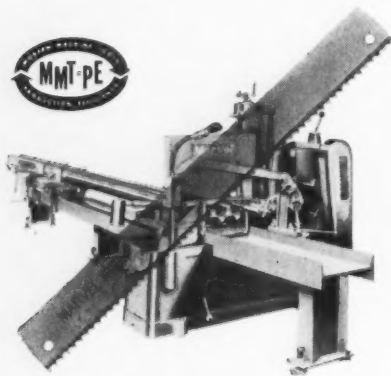
If you are the owner of a MARVEL Hack Saw Machine, check the name on the blades being used in it. If they are not MARVEL Blades, the chances are very good that you are not getting all the cutting-off speed, accuracy, and economy you paid for when you bought a MARVEL Saw.  Consider this fact. The hack saw *blade* is the cutting tool that actually

does the cutting job. If the machine is expected to deliver its full efficiency, the blade must possess a ruggedness comparable to that of the machine.  Isn't it logical, then, that the blades you use be as carefully selected as the machine itself? Here is another fact:

The MARVEL High-Speed-Edge Hack Saw Blade was designed specifically to withstand the heavy feed pressures and high cutting speeds your MARVEL Hack Saw can deliver.

 Only MARVEL UNBREAKABLE Hack Saw Blades can be safely tensioned taut enough to provide the maximum rigidity of the cutting tool necessary for accurate cutting-off; and at

the same time, protect both the operator from injury and the machine from damage that so frequently occurs with "breakable" blades.



**ARMSTRONG-BLUM MFG. CO.**  
5700 Bloomingdale Avenue • Chicago, Illinois



Why not be certain your MARVEL saw is delivering the high performance you had originally purchased, by using the only blade capable of utilizing the power and accuracy built into the machine? MARVEL Hack Saw Machines and MARVEL High-Speed-Edge Blades are an unbeatable combination. MARVEL High-Speed-Edge Hack Saw Blades are stocked and sold by leading Industrial Distributors everywhere.

For more data circle 333 on Postpaid Card

# NOW!

for the **FIRST** time  
**HYDRAULIC FEED**  
on a 10" x 16" grinder

**LOW COST**  
Micro-Precision,  
High Speed Grinding

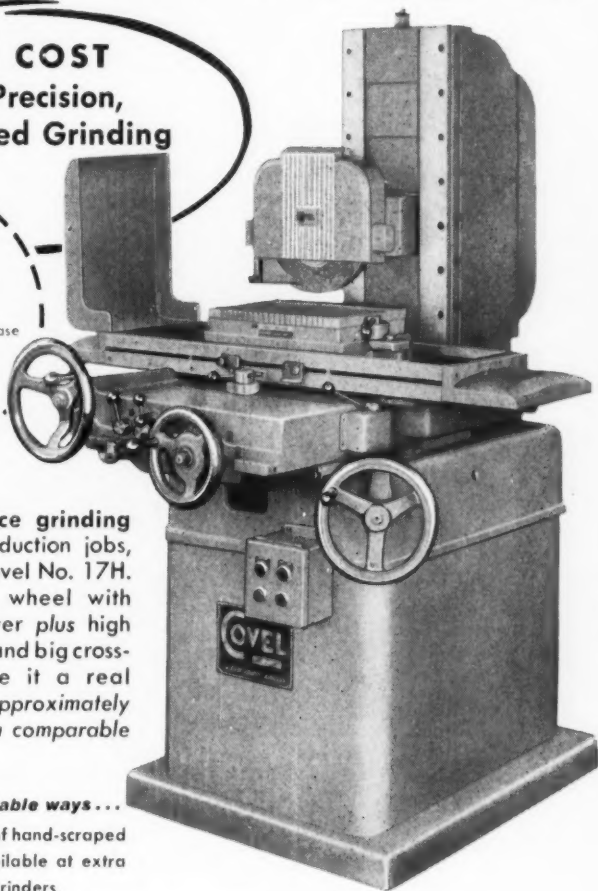
No. 17H  
Priced at only  
**\$3580.00**

to give you the operating ease  
and high speed of hy-  
draulic feed for little  
more than the cost of  
a hand feed grinder.

For precision surface grinding  
on tool room or production jobs,  
you can't beat the Covell No. 17H.  
The large grinding wheel with  
plenty of direct power *plus* high  
speed hydraulic feed and big cross-  
feed capacity make it a real  
money saver. Grinds approximately  
twice as fast as with a comparable  
hand feed machine.

**First with hard chrome table ways...**

Preserve original accuracy of hand-scraped  
V and Flat tableways. Available at extra  
cost on all Covell Surface Grinders.



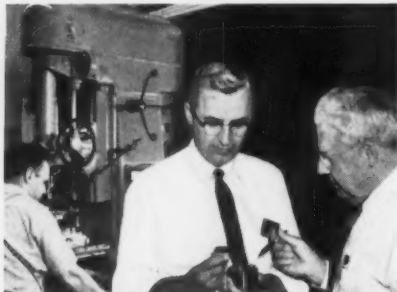
**COVELL** **PRECISION**  
**GRINDERS**  
**BENTON HARBOR, MICHIGAN**

For more data circle 334 on Postpaid Card

Write, wire or call us TODAY  
We'll gladly show you what  
the Covell 17H can do for you.  
Ask for Bulletin M-50.

# "The No. 3's split the tenths!"

So report users of Moore's New Jig Borer and Jig Grinder



"Our operators feel that these are the best machines they have ever worked on. They take care of the tenth-splitting tolerances required by industry today. Over the years we have enlarged our Moore Jig Boring and Jig Grinding Department to 15 machines." These are the words of Herbert Harig, President (left above), and Karl Harig, Chairman (at right), Harig Manufacturing Corporation, Chicago, Illinois.



Among the highly skilled toolroom operators in the Federal Products Corporation, Providence, Rhode Island, is this talented jig grinder operator, Mrs. Florence Smith. Mrs. Smith achieves ultra-precise results with the No. 3 Moore Jig Grinder.

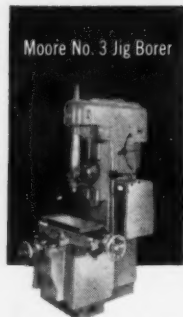


**HOLES, CONTOURS AND SURFACES,**  
Moore's authoritative book, tells how to produce tools, dies and precision parts the modern way.  
424 pages, 495 illustrations, \$5 in U.S.A., \$6 elsewhere.

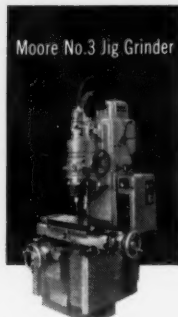
**ADD MOORE TOOLS**

**TO YOUR TOOLROOM**

JIG BORERS • JIG GRINDERS • PANTOGRAPH WHEEL DRESSERS • PRECISION ROTARY TABLES • HOLE LOCATION ACCESSORIES  
For more data circle 335 on Postpaid Card



You will easily break the "tenth" barrier with this accurate machine. No gibs...no overhang...improved drive...speed range of 60 to 2250 RPM...11 x 24" table working surface. It bores, drills, reams and spots holes in dies, jigs and production parts with unequalled speed and accuracy.



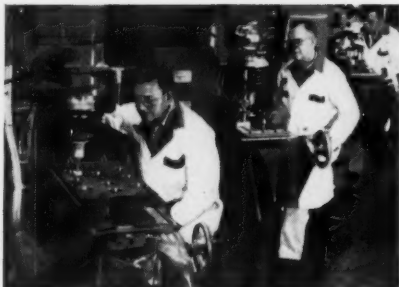
With this new, larger No. 3 model, you can grind—with split-tenth accuracy—holes plus regular and irregular contours to size and location after hardening. Faster strokes are provided for chop-grinding...infinite spindle speeds, 40 to 250 RPM...larger table working surface, 11 x 24".

All hardened, ground and lapped ways. Made and calibrated to the new international inch.

Write today for literature describing the many advantages of the No. 3 Moore Jig Borers and Jig Grinders.

**MOORE SPECIAL TOOL COMPANY, INC.**

300 Union Avenue, Bridgeport 7, Conn.



"We have found that it costs real dollars and cents to operate without Moore equipment. This cost factor is just one of many reasons why we recently added the new Moore Model No. 3 Jig Grinder. This Machine, with its tenth-splitting accuracy, hardened ways and wider range, enables us to service more customers better." Statement by Val Koller, President, Koller Die & Tool Co., Milwaukee, Wisconsin.



58-20

## Here's Why Continental Counterbore Drives Never Bind ! Never Fail !

Continental Counterbores operate precision-smooth and detach with a *twist of the wrist* because the driving forces generate *compressing* not *shearing* action in the holder. They never bind, deliver long-lasting, trouble-free operation.

In Continental Counterbores, you get extra torsional rigidity because drive lugs are close to the seating shoulder of the cutter. Double lugs on the cutter engage double abutments in the holder to form a powerful tool. But best testimony to the satisfaction you get from these counterbores is this: *no one has ever reported failure of a Continental Counterbore Drive!* For more information, call your local Ex-Cell-O Representative or write to Continental Tool Works in Detroit. Available individually or in a choice of three sets.

For more data circle 336 on Postpaid Card



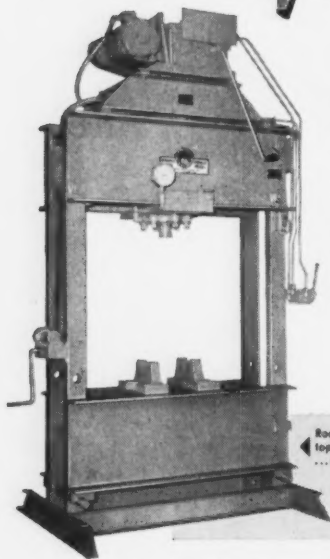
Continental  
TOOL WORKS

Division of



EX-CELL-O CORPORATION  
DETROIT 32, MICHIGAN

# A *Rodgers* Shop Press is **BEST for YOU!**

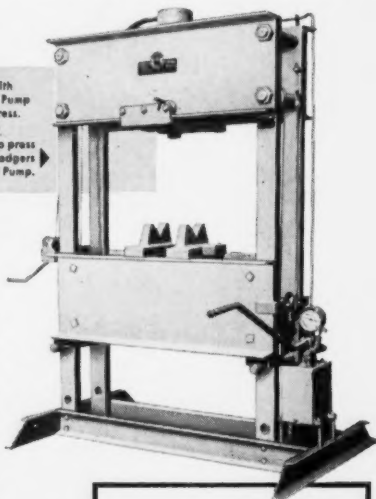


← Rodgers 100 ton shop press with top mounted Greenlee Power Pump ... cylinder travels width of press.

→ Rodgers 100 ton shop press with Rodgers 2 speed Hand Pump.

## HERE'S WHY:

- **LONGEST RAM TRAVEL** with maximum hydraulic power throughout entire stroke.
- **REMOVABLE CYLINDER** for independent hydraulic power away from the press.
- **CYLINDER TRAVEL** full width of press, either way.
- **OPEN ENDS** allow long pieces to extend through sides of press.
- **EXTRA WIDE** inside work space to handle bigger jobs more easily.
- **GREATER STRENGTH** with heavy bar stock sides and pins—bearing blocks support bolster to give uniform distribution of pressure.



**W**HEN YOU INVEST in a shop press it is more important to compare performance than initial cost!

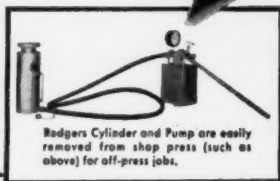
Rodgers Shop Presses are designed and built for the most versatile service, and longest trouble-free life. In the shop they handle hundreds of diversified jobs... pressing, bending, straightening, assembling. For field work the Rodgers cylinder and pump are easily removed from the press, making an ideal portable power unit for jacking, lifting, heavy shaft removal and similar work.

Rodgers produces the most complete line of shop presses available—capacities from 60 to 400 tons—in varied standard models with power pumps, top mounted or placed at the side—or hand pumps with 2 or 3 speeds.

When you compare shop press performance and cost you will find a Rodgers is best for you, too. Ask your Rodgers Representative for complete details—or write us.

SEND FOR **NEW CATALOG**...

It gives useful information and complete specifications.



Rodgers Cylinder and Pump are easily removed from shop press (such as above) for off-press jobs.



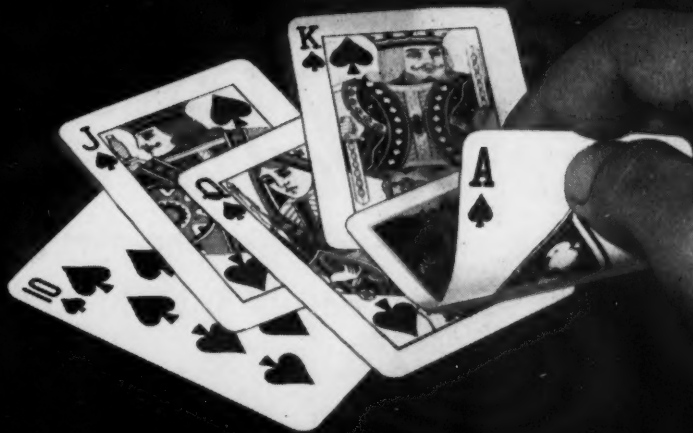
## RODGERS HYDRAULIC, Inc.

**Pioneers In High Pressure Hydraulics Since 1932**

7447 WALKER STREET • MINNEAPOLIS 26, MINNESOTA

For more data circle 337 on Postpaid Card





**You're  
not gambling  
IF you have an**



**in the hole!**

ACE DRILL BUSHINGS are always a sure bet!

- Largest deliverable stocks immediately available from 3 strategically located factory warehouses and 200 distributors.
- Highest quality
- Longer life • Closer tolerances • Concentricity — .0003" I.I.R., — closer on request.
- Name your size! We catalog over 25 thousand A.S.A. or ACE standards, micro and super sizes plus bushings for embedding in plastic or castable materials.

*Be Specific — Always Specify ACE!*

STOCKED FOR IMMEDIATE DELIVERY BY LEADING TOOLING SPECIALISTS IN YOUR COMMUNITY

## ACE DRILL BUSHINGS

### NEW JERSEY

611 McCarter Highway  
NEWARK 2 Mitchell 2-3006



### CALIFORNIA

HOME OFFICE  
5407 Fountain Ave.  
LOS ANGELES 29 HO 9-8253

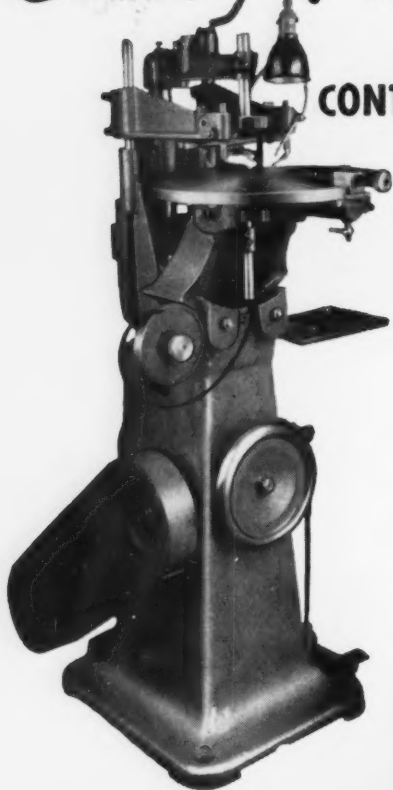


### MICHIGAN

10620 West Nine Mile Road  
DETROIT 37 Lincoln 8-0777

# Save Hours

in tool rooms  
and die shops with  
**CONTOUR SAWING AND FILING**



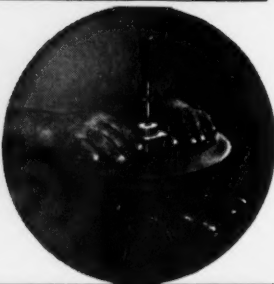
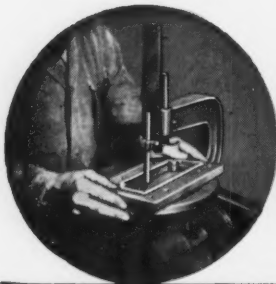
You can save real time and money in the production of parts for jigs and fixtures, dies, gages, templates and special machine production by using an Oliver of Adrian contour sawing and filing machine.

The Oliver is so simple to operate that all sawing, filing and lapping can be handled by an ordinary mechanic—saving a skilled die maker's costly time. Parts can be shaped to dimension faster, more accurately with no hand filing or semi-finishing operations. Available in five types — bench or pedestal. Write today.

**OLIVER of ADRIAN**

**OLIVER INSTRUMENT COMPANY**

1430 E. Maumee St. • Adrian, Michigan



For more data circle 339 on Postpaid Card

**roughest part surfaces  
finished to 4 micro in. or less  
*in one pass ... on any machine!***



• **microller** burnishing tool finishes or sizes at **FEED RATES OF 8 TO 12 IN. PER MIN.!**

• **CUTS PRODUCTION TIME, COSTS, 90% AND MORE!**

- Tool finishes roughest turned surfaces of 120 mu.-in. and higher to 4 mu. and lower in one pass at feed rates of 8 to 12 in. per minute.
  - Finishes all machineable metals. Tools are made for all types of surfaces; internal and external, cylindrical... tapered, radial, flat.
  - Use tool on any machine. Use it on drill presses or lathes as a secondary operation... or on automatics where other operations are being performed.
  - rolls last for thousands of parts. Tool maintains size setting. No adjustments necessary. Wearing parts replaceable. Simplest set up and operation. No skill required. Tool feeds and releases automatically.
  - Off the shelf delivery of standard tools and replacement parts.
  - Burnishing action *rolls* out tool marks... compacting and condensing the grain structure to form a long-wearing, work-hardened surface.
  - The top twenty companies in metalworking... plus more than a thousand other shops have replaced costly abrasive methods with Microller burnishing. Reports of 90% savings in production time and costs are common. Write for more information or send post-paid card in magazine.
- ADJUSTABLE FOR SIZE CONTROL**
- Sizes in increments of .000075" or less... performs sizing operations never before possible. Invaluable for bearing seats, oilite bushings, salvaging parts out of tolerance, etc.
  - Run thousands of parts without tool wear. No stones to replace. Precision-hardened

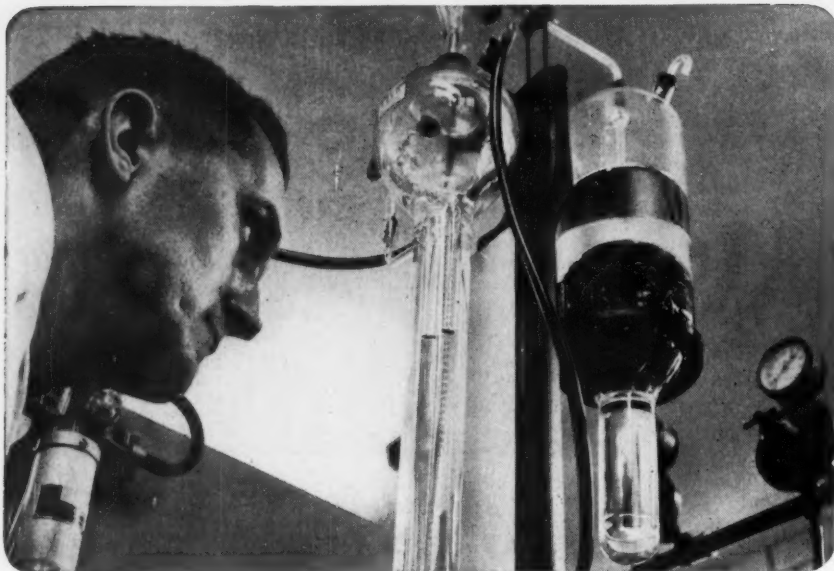
For more data circle 340 on Postpaid Card



**MADISON FAESSLER TOOL CO.**

P. O. BOX 1137, PROVIDENCE, R. I.

**Experience—the added alloy in Allegheny Ludlum tool steels**



QUICK, FAST TESTING for carbon content is done not once or twice but 8 times per melt in A-L's Chem Lab with this direct reading Leco carbon determinator.

## **Carbon content checked 8 times during melt to guarantee A-L tool steel hardenability**

**Lab tests for carbon eliminate your guesswork; provide high hardness, uniform hardenability, reproducible tool performance.**

Because carbon has the greatest influence on hardenability, Allegheny Ludlum watches it carefully during the melt. Testing a specimen for carbon takes only a few minutes. Therefore, A-L checks for carbon content 8 times during the melt, and makes the necessary adjustments to insure accurate control of carbon. This control means Allegheny Ludlum can hold carbon content to a closer range than most customers specify.

Carbon control at Allegheny Ludlum assures you of precise response to heat treating. This control in the melt brings you predictable, high hardness, uniform hardenability and reproducible tool performance.

This is just one of the many things A-L does to insure

high quality. Here are some others: close control over forging techniques, rigid temperature-time programming, careful testing of billets prior to processing to insure good surface and sound interior, control over annealing to give you the right hardness for your exact machining operation, thorough metallurgical testing to insure top tool steel quality and meeting of your specifications.

Allegheny Ludlum stocks a complete line of tool steel sizes and grades. Call your nearest A-L representative; you'll get quick service and counsel on such problems as heat treating, machining, grade selection, etc. Or write for A-L's publication list which gives full data on the more than 125 technical publications offered. They'll make your job easier.

**ALLEGHENY LUDLUM STEEL CORPORATION,**  
Oliver Bldg., Pittsburgh 22, Pa. Address Dept. MS-5.

W50178-1

### **ALLEGHENY LUDLUM**

Tool Steel warehouse stocks throughout the country... Check the yellow pages  
every grade of tool steel... every help in using it

For more data circle 341 on Postpaid Card



NEW SIZES ADDED  
DAILY... IF NOT  
LISTED—  
WRITE

## DELIVERY FROM STOCK

## SPECIAL RH & LH

## TAPS • DIES • THREAD PLUG & RING GAGES



DEALER

**INQUIRIES INVITED**

SIZE	THREADS PER INCH
0000	160
000	120
00	90-96-112
0	56-64-72-80-90
1	48-56-60-64-80-90
2	40-48-52-56-60-64-72-80-96
3	36-40-46-60-72-80
4	30-32-38-42-41-56-60-96
5	22-27-30-32-36-38-42-48
6	50-56-60-64-72-80
7	40-48-52-56-60-64-72-80-96
8	28-30-32-34-36-38-40-44-48
9	24-26-28-30-32-34-36-40-44-48
10	56-64-72-80
11	24-28-30-32-36-40
12	40-48-52-56-60-64-72-80-96
13	20-22-24-28-30-32-36
14	16-18-20-22-24-28-30-32-36-40-44-48
15	18-20-24-28-32
16	16-18-20-22-24-28-32-36
17	18-20
18	16-18-20-24-32-40
19	18-20
20	16-18-20-24-32
21	16-18-20-24
22	16-18-20-24
23	16-18-20-24
24	16-18-20-24
25	16-18-20-24
26	16-18-20-24
27	16-18-20-24
28	16-18-20-24
29	16-18-20-24
30	16-18-20-24
31	16-18-20-24
32	16-18-20-24
33	16-18-20-24
34	16-18-20-24
35	16-18-20-24
36	16-18-20-24
37	16-18-20-24
38	16-18-20-24
39	16-18-20-24
40	16-18-20-24
41	16-18-20-24
42	16-18-20-24
43	16-18-20-24
44	16-18-20-24
45	16-18-20-24
46	16-18-20-24
47	16-18-20-24
48	16-18-20-24
49	16-18-20-24
50	16-18-20-24
51	16-18-20-24
52	16-18-20-24
53	16-18-20-24
54	16-18-20-24
55	16-18-20-24
56	16-18-20-24
57	16-18-20-24
58	16-18-20-24
59	16-18-20-24
60	16-18-20-24
61	16-18-20-24
62	16-18-20-24
63	16-18-20-24
64	16-18-20-24
65	16-18-20-24
66	16-18-20-24
67	16-18-20-24
68	16-18-20-24
69	16-18-20-24
70	16-18-20-24
71	16-18-20-24
72	16-18-20-24
73	16-18-20-24
74	16-18-20-24
75	16-18-20-24
76	16-18-20-24
77	16-18-20-24
78	16-18-20-24
79	16-18-20-24
80	16-18-20-24
81	16-18-20-24
82	16-18-20-24
83	16-18-20-24
84	16-18-20-24
85	16-18-20-24
86	16-18-20-24
87	16-18-20-24
88	16-18-20-24
89	16-18-20-24
90	16-18-20-24
91	16-18-20-24
92	16-18-20-24
93	16-18-20-24
94	16-18-20-24
95	16-18-20-24
96	16-18-20-24
97	16-18-20-24
98	16-18-20-24
99	16-18-20-24
100	16-18-20-24

SIZE	THREADS PER INCH
18	24
19	24-28-32-36-40
20	20-22-24-26-27-28-30-32-36-38-40
22	24
24	20-22-24-28-32-36-40
26	24
28	10-12-14-16-18-22-23-24
30	25-26-27-28-30-32-36-38-40
32	20-26-40-44-72-80
34	12-18-20-24-27-28-32-40
36	10-10
38	16-18-20-24-26-27-28-32-36-40-44-56-57-58-64
40	18-24
42	10-12-14-16-20-22-26-27-28-30-32-36-40-44-48-50-54
44	16-18-20-24-36
46	16-18-20-22-26-27-28-32-36-40-44
48	28
50	10-12-14-18-20-22-26-27-28-30-32-36-40-44-48-56-64-72
52	14-16-18-20-24-27-32-40-44-24
54	12-14-16-18-20-24-28-32-40
56	24
58	10-12-16-18-22-24-26-27-28-30-32-36-40-48-56
60	12-14-16-20
62	12-14-20-24-27-28-32-36-40
64	10-11-12-14-16-18-22-24-26-27-28-30-32-36-40-44-48-56-68-70-72-80
66	12-13-20-24
68	12-13-13-14-16-18-20-24-26-27-28-30-32-36-40-48-56-80
70	24
72	10-13-14-16-20-24-26-27-28-30-32-36-40-48-56-80
74	10-12-18-20
76	12-18-20-24-28-32-35-40
78	10-12-14-16-20-24-26-27-28-30-32-36-40-48-56-64

SIZE	THREADS PER INCH
41/64	11-18-24
21/32	10-11-12-14-16-18-20-24-27-32-40
11/16	10-11-12-14-16-18-20-22-24-27-28-30-32-36-40
23/32	11-12-16-18-20-24-27-32-36
47/64	10-12-16-18-20
3/4	6-8-9-11-12-14-15-18-20-22-24-27-28-30-32-36-40-48
49/64	10-12-16-18-20-24-27-32-36-40
25/32	10-11-12-14-16-18-20-24-27-32-36-40
13/16	16
.800	10-12-14-16-18-20-24-27-32-40
85/64	28-32-40
535	16
56	6-12
27/32	10-11-12-14-16-18-20-24-26-27-28-30-32-36-40-48
7/80	14
8	8-10-11-12-13-16-20-24-26-27-28-32-36-40
29/32	9-12-14-16-18-20-24-27-28-32
15/16	8-9-10-12-14-16-18-20-24-26-27-28-30-32-36-40
31/32	8-9-12-16-18-20-24-28-32
1	5-7-9-10-11-12-16-18-20-24-26-27-28-30-32-36-40-48
1-1/32	8-12-14-16-18-20
1-1/16	12-14-16-18-20
1-7/16	6-7-8-10-12-14-16-17-18-20-24-27-28-32-40
1-1/8	7-8-9-12-14-16-18-20-32
1-3/8	8-10-14-16-18-20-24-27-28-32-40
1-5/8	12-14-16-18-20-24-27-32
1-7/8	7-8-10-12-14-16-18-20-24-27-28-32-40
1-1/4	8-10-14-16-18-20-24-27-28-32
1-3/4	8-10-14-16-18-20-24-27-28-32
1-5/16	6-7-8-10-12-14-16-18-20-24-27-28-32-40-48
1-3/8	8-10-14-16-18-20-24-27-28-32-40
1-7/16	12-16-18-20
1-1/2	8-10-14-16-18-20-24-27-28-32-40

SIZES		THREADS PER INCH	
1-1/2	1-1/2	7-8-10-12-14-16-18-20-24-28-32-40	
1-17/32	1-17/32	7-12-16-18-20-24-32	
1-9/16	1-9/16	7-8-10-12-14-16-18-20-24-32	
1-5/8	1-5/8	5-3 1/2-6-8-10-12-14-16-18-20-24-32	
1-11/16	1-11/16	8-10-12-14-16-18-20-24-32	
1-23/32	1-23/32	5-8-12-16-18-20	
1-3/4	1-3/4	5-8-10-12-14-16-18-20-24-28-32-40	
1.767	1.767	18	
1.7715	1.7715	12	
1.775	1.775	10	
1-7/8	1-7/8	5-8-10-12-14-16-18-20-24-32	
2	2	5-8-10-12-14-16-18-20-24-32	
2-1/16	2-1/16	4-6-8-10-12-14-16-18-20-24-32	
2-1/8	2-1/8	4-6-8-10-12-14-16-18-20-24-32	
2-1/4	2-1/4	4-6-8-10-12-14-16-18-20-24-32	
2-3/8	2-3/8	4-6-8-10-12-14-16-18-20-24-32	
2-1/2	2-1/2	4-6-8-10-12-14-16-18-20-24-32	
2-5/8	2-5/8	4-6-8-10-12-14-16-18-20-24-32	
2-3/4	2-3/4	4-6-8-10-12-14-16-18-20-24-32	
2-7/8	2-7/8	4-6-8-10-12-14-16-18-20-24-32	
2-15/16	2-15/16	4-6-8-10-12-14-16-18-20-32	
3	3	3 1/2-4-6-8-10-12-14-16-18-20-24-32	
3-1/16	3-1/16	4-6-8-10-12-14-16-18-20-24-32	
3-1/8	3-1/8	4-6-8-10-12-14-16-18-20-24-32	
3-3/16	3-3/16	4-6-8-10-12-14-16-18-20-24-32	
3-1/4	3-1/4	4-6-8-10-12-14-16-18-20-24-32	
3-5/8	3-5/8	4-6-8-10-12-16	
3-1/2	3-1/2	4-6-8-10-12-16	
3-7/8	3-7/8	4-6-8-10-12-16	
3-3/4	3-3/4	4-6-8-10-12-16	
3-15/16	3-15/16	4-6-8-10-12-16	
4	4	4-6-8-10-12-16	
4-1/16	4-1/16	4-6-8-10-12-16	
4-1/8	4-1/8	4-6-8-10-12-16	
4-1/4	4-1/4	4-6-8-10-12-16	
4-3/8	4-3/8	4-6-8-10-12-16	
4-1/2	4-1/2	4-6-8-10-12-16	
4-5/8	4-5/8	4-6-8-10-12-16	
4-3/4	4-3/4	4-6-8-10-12-16	
4-7/8	4-7/8	4-6-8-10-12-16	
4-15/16	4-15/16	4-6-8-10-12-16	
5	5	4-6-8-10-12-16	
5-1/16	5-1/16	4-6-8-10-12-16	
5-1/8	5-1/8	4-6-8-10-12-16	
5-1/4	5-1/4	4-6-8-10-12-16	
5-3/8	5-3/8	4-6-8-10-12-16	
5-1/2	5-1/2	4-6-8-10-12-16	
5-5/8	5-5/8	4-6-8-10-12-16	
5-3/4	5-3/4	4-6-8-10-12-16	
5-7/8	5-7/8	4-6-8-10-12-16	
5-15/16	5-15/16	4-6-8-10-12-16	
6	6	4-6-8-10-12-16	
6-1/16	6-1/16	4-6-8-10-12-16	
6-1/8	6-1/8	4-6-8-10-12-16	
6-1/4	6-1/4	4-6-8-10-12-16	
6-3/8	6-3/8	4-6-8-10-12-16	
6-1/2	6-1/2	4-6-8-10-12-16	
6-5/8	6-5/8	4-6-8-10-12-16	
6-3/4	6-3/4	4-6-8-10-12-16	
6-7/8	6-7/8	4-6-8-10-12-16	
6-15/16	6-15/16	4-6-8-10-12-16	
7	7	4-6-8-10-12-16	
7-1/16	7-1/16	4-6-8-10-12-16	
7-1/8	7-1/8	4-6-8-10-12-16	
7-1/4	7-1/4	4-6-8-10-12-16	
7-3/8	7-3/8	4-6-8-10-12-16	
7-1/2	7-1/2	4-6-8-10-12-16	
7-5/8	7-5/8	4-6-8-10-12-16	
7-3/4	7-3/4	4-6-8-10-12-16	
7-7/8	7-7/8	4-6-8-10-12-16	
7-15/16	7-15/16	4-6-8-10-12-16	
8	8	4-6-8-10-12-16	
8-1/16	8-1/16	4-6-8-10-12-16	
8-1/8	8-1/8	4-6-8-10-12-16	
8-1/4	8-1/4	4-6-8-10-12-16	
8-3/8	8-3/8	4-6-8-10-12-16	
8-1/2	8-1/2	4-6-8-10-12-16	
8-5/8	8-5/8	4-6-8-10-12-16	
8-3/4	8-3/4	4-6-8-10-12-16	
8-7/8	8-7/8	4-6-8-10-12-16	
8-15/16	8-15/16	4-6-8-10-12-16	
9	9	4-6-8-10-12-16	
9-1/16	9-1/16	4-6-8-10-12-16	
9-1/8	9-1/8	4-6-8-10-12-16	
9-1/4	9-1/4	4-6-8-10-12-16	
9-3/8	9-3/8	4-6-8-10-12-16	
9-1/2	9-1/2	4-6-8-10-12-16	
9-5/8	9-5/8	4-6-8-10-12-16	
9-3/4	9-3/4	4-6-8-10-12-16	
9-7/8	9-7/8	4-6-8-10-12-16	
9-15/16	9-15/16	4-6-8-10-12-16	
10	10	4-6-8-10-12-16	
10-1/16	10-1/16	4-6-8-10-12-16	
10-1/8	10-1/8	4-6-8-10-12-16	
10-1/4	10-1/4	4-6-8-10-12-16	
10-3/8	10-3/8	4-6-8-10-12-16	
10-1/2	10-1/2	4-6-8-10-12-16	
10-5/8	10-5/8	4-6-8-10-12-16	
10-3/4	10-3/4	4-6-8-10-12-16	
10-7/8	10-7/8	4-6-8-10-12-16	
10-15/16	10-15/16	4-6-8-10-12-16	
11	11	4-6-8-10-12-16	
11-1/16	11-1/16	4-6-8-10-12-16	
11-1/8	11-1/8	4-6-8-10-12-16	
11-1/4	11-1/4	4-6-8-10-12-16	
11-3/8	11-3/8	4-6-8-10-12-16	
11-1/2	11-1/2	4-6-8-10-12-16	
11-5/8	11-5/8	4-6-8-10-12-16	
11-3/4	11-3/4	4-6-8-10-12-16	
11-7/8	11-7/8	4-6-8-10-12-16	
11-15/16	11-15/16	4-6-8-10-12-16	
12	12	4-6-8-10-12-16	
12-1/16	12-1/16	4-6-8-10-12-16	
12-1/8	12-1/8	4-6-8-10-12-16	
12-1/4	12-1/4	4-6-8-10-12-16	
12-3/8	12-3/8	4-6-8-10-12-16	
12-1/2	12-1/2	4-6-8-10-12-16	
12-5/8	12-5/8	4-6-8-10-12-16	
12-3/4	12-3/4	4-6-8-10-12-16	
12-7/8	12-7/8	4-6-8-10-12-16	
12-15/16	12-15/16	4-6-8-10-12-16	
13	13	4-6-8-10-12-16	
13-1/16	13-1/16	4-6-8-10-12-16	
13-1/8	13-1/8	4-6-8-10-12-16	
13-1/4	13-1/4	4-6-8-10-12-16	
13-3/8	13-3/8	4-6-8-10-12-16	
13-1/2	13-1/2	4-6-8-10-12-16	
13-5/8	13-5/8	4-6-8-10-12-16	
13-3/4	13-3/4	4-6-8-10-12-16	
13-7/8	13-7/8	4-6-8-10-12-16	
13-15/16	13-15/16	4-6-8-10-12-16	
14	14	4-6-8-10-12-16	
14-1/16	14-1/16	4-6-8-10-12-16	
14-1/8	14-1/8	4-6-8-10-12-16	
14-1/4	14-1/4	4-6-8-10-12-16	
14-3/8	14-3/8	4-6-8-10-12-16	
14-1/2	14-1/2	4-6-8-10-12-16	
14-5/8	14-5/8	4-6-8-10-12-16	
14-3/4	14-3/4	4-6-8-10-12-16	
14-7/8	14-7/8	4-6-8-10-12-16	
14-15/16	14-15/16	4-6-8-10-12-16	
15	15	4-6-8-10-12-16	
15-1/16	15-1/16	4-6-8-10-12-16	
15-1/8	15-1/8	4-6-8-10-12-16	
15-1/4	15-1/4	4-6-8-10-12-16	
15-3/8	15-3/8	4-6-8-10-12-16	
15-1/2	15-1/2	4-6-8-10-12-16	
15-5/8	15-5/8	4-6-8-10-12-16	
15-3/4	15-3/4	4-6-8-10-12-16	
15-7/8	15-7/8	4-6-8-10-12-16	
15-15/16	15-15/16	4-6-8-10-12-16	
16	16	4-6-8-10-12-16	
16-1/16	16-1/16	4-6-8-10-12-16	
16-1/8	16-1/8	4-6-8-10-12-16	
16-1/4	16-1/4	4-6-8-10-12-16	
16-3/8	16-3/8	4-6-8-10-12-16	
16-1/2	16-1/2	4-6-8-10-12-16	
16-5/8	16-5/8	4-6-8-10-12-16	
16-3/4	16-3/4	4-6-8-10-12-16	
16-7/8	16-7/8	4-6-8-10-12-16	
16-15/16	16-15/16	4-6-8-10-12-16	
17	17	4-6-8-10-12-16	
17-1/16	17-1/16	4-6-8-10-12-16	
17-1/8	17-1/8	4-6-8-10-12-16	
17-1/4	17-1/4	4-6-8-10-12-16	
17-3/8	17-3/8	4-6-8-10-12-16	
17-1/2	17-1/2	4-6-8-10-12-16	
17-5/8	17-5/8	4-6-8-10-12-16	
17-3/4	17-3/4	4-6-8-10-12-16	
17-7/8	17-7/8	4-6-8-10-12-16	
17-15/16	17-15/16	4-6-8-10-12-16	
18	18	4-6-8-10-12-16	
18-1/16	18-1/16	4-6-8-10-12-16	
18-1/8	18-1/8	4-6-8-10-12-16	
18-1/4	18-1/4	4-6-8-10-12-16	
18-3/8	18-3/8	4-6-8-10-12-16	
18-1/2	18-1/2	4-6-8-10-12-16	
18-5/8	18-5/8	4-6-8-10-12-16	
18-3/4	18-3/4	4-6-8-10-12-16	
18-7/8	18-7/8	4-6-8-10-12-16	
18-15/16	18-15/16	4-6-8-10-12-16	
19	19	4-6-8-10-12-16	
19-1/16	19-1/16	4-6-8-10-12-16	
19-1/8	19-1/8	4-6-8-10-12-16	
19-1/4	19-1/4	4-6-8-10-12-16	
19-3/8	19-3/8	4-6-8-10-12-16	
19-1/2	19-1/2	4-6-8-10-12-16	
19-5/8	19-5/8	4-6-8-10-12-16	
19-3/4	19-3/4	4-6-8-10-12-16	
19-7/8	19-7/8	4-6-8-10-12-16	
19-15/16	19-15/16	4-6-8-10-12-16	
20	20	4-6-8-10-12-16	
20-1/16	20-1/16	4-6-8-10-12-16	
20-1/8	20-1/8	4-6-8-10-12-16	
20-1/4	20-1/4	4-6-8-10-12-16	
20-3/8	20-3/8	4-6-8-10-12-16	
20-1/2	20-1/2	4-6-8-10-12-16	
20-5/8	20-5/8	4-6-8-10-12-16	
20-3/4	20-3/4	4-6-8-10-12-16	
20-7/8	20-7/8	4-6-8-10-12-16	
20-15/16	20-15/16	4-6-8-10-12-16	
21	21	4-6-8-10-12-16	
21-1/16	21-1/16	4-6-8-10-12-16	
21-1/8	21-1/8	4-6-8-10-12-16	
21-1/4	21-1/4	4-6-8-10-12-16	
21-3/8	21-3/8	4-6-8-10-12-16	
21-1/2	21-1/2	4-6-8-10-12-16	
21-5/8	21-5/8	4-6-8-10-12-16	
21-3/4	21-3/4	4-6-8-10-12-16	
21-7/8	21-7/8	4-6-8-10-12-16	
21-15/16	21-15/16	4-6-8-10-12-16	
22	22	4-6-8-10-12-16	
22-1/16	22-1/16	4-6-8-10-12-16	
22-1/8	22-1/8	4-6-8-10-12-16	
22-1/4	22-1/4	4-6-8-10-12-16	
22-3/8	22-3/8	4-6-8-10-12-16	
22-1/2	22-1/2	4-6-8-10-12-16	
22-5/8	22-5/8	4-6-8-10-12-16	
22-3/4	22-3/4	4-6-8-10-12-16	
22-7/8	22-7/8	4-6-8-10-12-16	
22-15/16	22-15/16	4-6-8-10-12-16	
23	23	4-6-8-10-12-16	
23-1/16	23-1/16	4-6-8-10-12-16	
23-1/8	23-1/8	4-6-8-10-12-16	
23-1/4	23-1/4	4-6-8-10-12-16	
23-3/8	23-3/8	4-6-8-10-12-16	
23-1/2	23-1/2	4-6-8-10-12-16	
23-5/8	23-5/8	4-6-8-10-12-16	
23-3/4	23-3/4	4-6-8-10-12-16	
23-7/8	23-7/8	4-6-8-10-12-16	
23-15/16	23-15/16	4-6-8-10-12-16	
24	24	4-6-8-10-12-16	
24-1/16	24-1/16	4-6-8-10-12-16	
24-1/8	24-1/8	4-6-8-10-12-16	
24-1/4	24-1/4	4-6-8-10-12-16	
24-3/8	24-3/8	4-6-8-10-12-16	
24-1/2	24-1/2	4-6-8-10-12-16	
24-5/8	24-5/8	4-6-8-10-12-16	
24-3/4	24-3/4	4-6-8-10-12-16	
24-7/8	24-7/8	4-6-8-10-12-16	
24-15/16	24-15/16	4-6-8-10-12-16	
25	25	4-6-8-10-12-16	
25-1/16	25-1/16	4-6-8-10-12-16	
25-1/8	25-1/8	4-6-8-10-12-16	
25-1/4	25-1/4	4-6-8-10-12-16	
25-3/8	25-3/8	4-6-8-10-12-16	
25-1/2	25-1/2	4-6-8-10-12-16	
25-5/8	25-5/8	4-6-8-10-12-16	
25-3/4	25-3/4	4-6-8-10-12-16	
25-7/8	25-7/8	4-6-8-10-12-16	
25-15/16	25-15/16		

Many more  
sizes in  
stock up  
to 6" dia.

**LEFT HAND N.C. (USS)—N.F. (SAE) SIZES**

SEE ABOVE SECTION FOR MORE SIZES							
SIZE	THREADS	SIZE	THREADS	SIZE	THREADS	SIZE	THREADS
0	80	8	32-36	7/16	14-20	1"	8-12-14
1	64-72	10	24-32	1/2	13-20	1-1/8	7-12
2	56-64	12	24-28	9/16	12-18	1-1/4	7-12
3	48-56	14	20-24	5/8	11-18	1-5/16	6-12
4	36-40	1/4	20-28	11/16	11-16	1-3/8	6-12
5	40-44	5/16	18-24	3/4	10-16	1-7/16	6-12
6	32-40	3/8	16-24	7/8	9-14	1-1/2	6-12

## 'OVERSIZE' and 'UNDERSIZE' TAPS

RIGHT AND LEFT HAND N.C. AND N.F. SIZES

MACHINE SCREW	#2 to #5	Plus or Minus	.002, .003, .005
MACHINE SCREW	#6 to #14	Plus or Minus	.003, .005, .010
FRACTIONAL	1/4" to 1-1/2"	Plus or Minus	.003, .005, .010 .015, 1/64, 1/32

### Right & Left Hand—Unlisted

### 'Gun' or Spiral Pointed Taps

Size	Threads	Size	Threads
0	80 NF	7/8	9 NC, 14
1	56 NS	1	8 NC, 12-14
2	56 NC, 64 NF	1-1/8	7 NC, 12
9/16	52 NC, 18 NF	1-1/4	7 NC, 12
5/8	11 NC, 18 NF	1-3/8	6 NC, 12
11/16	11 NS, 16 NS	1-1/2	6 NC, 12
3/4	10 NC, 16 NF		

### Rand Hand—Unlisted 'Pulley' And Extra Length Taps

Size	Threads	Size	Threads
1-36	40 MG 40 MG	3-8	34 MG

4	36-40 NC, 48 NF	3/8	24-NF
5	40 NC, 44 NF	7/16	20-NF
6	32 NC, 40 NF	1/2	20-NF
8	32 NC, 36 NF	9/16	12 NC
10	24 NC, 32 NF	9/16	18 NF
12	24 NC, 28 NF	5/8	18 NF
1/4	28 NF	3/4	16 NF
5/16	24-NF	Also Larger Sizes NC & NF	

UNLISTED  
Right Hand "Pipe" Taps

"NPT"	"NPS"	EX. LENGTH
Tap: "NPT"	Size Thread	(inches)

Size	Thread	1/16	27	Size	Thread
1/16	27	1	8	1/16	27
1/4	27	1-1/4	11 $\frac{1}{2}$	1/8	27
1-1/2	8	1-1/2	11 $\frac{1}{2}$	1/8	27
1	8	2	11 $\frac{1}{2}$	1/4	18
1-1/2	8	2-1/2	8	1/4	18
1	8	3	8	3/8	18
1-1/2	8	3-1/2	8	1/2	18
1	8	4	8	3/4	18
Also British		Also British		1	

### Lefthand 'Pipe Taps' Taper and Straight

Size	Thread	Size	Thread
1/2"	1/2-20	1/2"	1/2-20
3/4"	3/4-16	3/4"	3/4-16
1"	1-14	1"	1-14
1 1/4"	1 1/4-12	1 1/4"	1 1/4-12
1 1/2"	1 1/2-12	1 1/2"	1 1/2-12
2"	2-12	2"	2-12
2 1/2"	2 1/2-10	2 1/2"	2 1/2-10
3"	3-10	3"	3-10
3 1/2"	3 1/2-8	3 1/2"	3 1/2-8
4"	4-8	4"	4-8
4 1/2"	4 1/2-6	4 1/2"	4 1/2-6
5"	5-6	5"	5-6
5 1/2"	5 1/2-5	5 1/2"	5 1/2-5
6"	6-5	6"	6-5
6 1/2"	6 1/2-4	6 1/2"	6 1/2-4
7"	7-4	7"	7-4
7 1/2"	7 1/2-4	7 1/2"	7 1/2-4
8"	8-4	8"	8-4
8 1/2"	8 1/2-4	8 1/2"	8 1/2-4
9"	9-4	9"	9-4
9 1/2"	9 1/2-4	9 1/2"	9 1/2-4
10"	10-4	10"	10-4
10 1/2"	10 1/2-4	10 1/2"	10 1/2-4
11"	11-4	11"	11-4
11 1/2"	11 1/2-4	11 1/2"	11 1/2-4
12"	12-4	12"	12-4
12 1/2"	12 1/2-4	12 1/2"	12 1/2-4
13"	13-4	13"	13-4
13 1/2"	13 1/2-4	13 1/2"	13 1/2-4
14"	14-4	14"	14-4
14 1/2"	14 1/2-4	14 1/2"	14 1/2-4
15"	15-4	15"	15-4
15 1/2"	15 1/2-4	15 1/2"	15 1/2-4
16"	16-4	16"	16-4
16 1/2"	16 1/2-4	16 1/2"	16 1/2-4
17"	17-4	17"	17-4
17 1/2"	17 1/2-4	17 1/2"	17 1/2-4
18"	18-4	18"	18-4
18 1/2"	18 1/2-4	18 1/2"	18 1/2-4
19"	19-4	19"	19-4
19 1/2"	19 1/2-4	19 1/2"	19 1/2-4
20"	20-4	20"	20-4
20 1/2"	20 1/2-4	20 1/2"	20 1/2-4
21"	21-4	21"	21-4
21 1/2"	21 1/2-4	21 1/2"	21 1/2-4
22"	22-4	22"	22-4
22 1/2"	22 1/2-4	22 1/2"	22 1/2-4
23"	23-4	23"	23-4
23 1/2"	23 1/2-4	23 1/2"	23 1/2-4
24"	24-4	24"	24-4
24 1/2"	24 1/2-4	24 1/2"	24 1/2-4
25"	25-4	25"	25-4
25 1/2"	25 1/2-4	25 1/2"	25 1/2-4
26"	26-4	26"	26-4
26 1/2"	26 1/2-4	26 1/2"	26 1/2-4
27"	27-4	27"	27-4
27 1/2"	27 1/2-4	27 1/2"	27 1/2-4
28"	28-4	28"	28-4
28 1/2"	28 1/2-4	28 1/2"	28 1/2-4
29"	29-4	29"	29-4
29 1/2"	29 1/2-4	29 1/2"	29 1/2-4
30"	30-4	30"	30-4
30 1/2"	30 1/2-4	30 1/2"	30 1/2-4
31"	31-4	31"	31-4
31 1/2"	31 1/2-4	31 1/2"	31 1/2-4
32"	32-4	32"	32-4
32 1/2"	32 1/2-4	32 1/2"	32 1/2-4
33"	33-4	33"	33-4
33 1/2"	33 1/2-4	33 1/2"	33 1/2-4
34"	34-4	34"	34-4
34 1/2"	34 1/2-4	34 1/2"	34 1/2-4
35"	35-4	35"	35-4
35 1/2"	35 1/2-4	35 1/2"	35 1/2-4
36"	36-4	36"	36-4
36 1/2"	36 1/2-4	36 1/2"	36 1/2-4
37"	37-4	37"	37-4
37 1/2"	37 1/2-4	37 1/2"	37 1/2-4
38"	38-4	38"	38-4
38 1/2"	38 1/2-4	38 1/2"	38 1/2-4
39"	39-4	39"	39-4
39 1/2"	39 1/2-4	39	

1/16	27	1	111
1/8	27	1-1/4	111
1/4	18	1-1/2	111
3/8	18	2	111
1/2	14	2-1/2	8
3/4	14	3	8
Also British		3-1/2	8
		Also British	

## ACME TAPS IN STOCK

**IF NOT IN STOCK—7 to 10 DAYS DELIVERY—**When ordering or requesting quotations, kindly furnish following information:

- (a) Kind of material being machined.
- (b) Depth of hole in inches, through or bottom.
- (c) Tap to be used horizontally or vertically.
- (d) Will tap turn, or is piece expected to be turned.
- (e) Is tapping job expected to require a time overrun?
- (f) Would tap be backed out of hole, or machined stoppped for release of tap.
- (g) If possible, submit thread length, and overall length of tap desired with blue print.

**SPECIAL REAMERS**  
*Immediate Delivery*

**H.S.S. Machine Reamers**  
Decimal, Fractional, Letter,  
and Wire Gauge Sizes  
Prices On Application

**SPECIAL—Right Hand High Speed  
"EXTRA LENGTH DRILLS"  
"AND LEFT HAND DRILLS"  
In Stock for Immediate Delivery**

Get all 3...

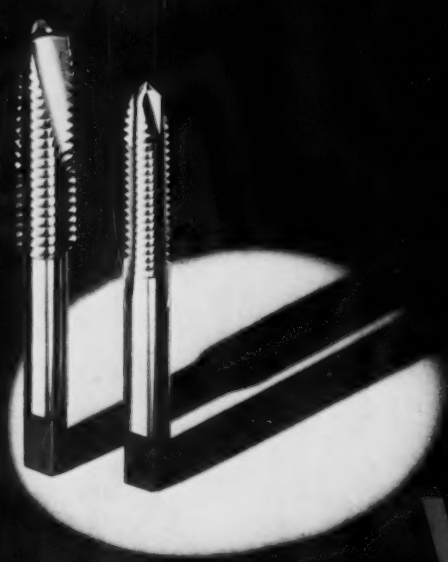
☒ DELIVERY  
☒ QUALITY  
☒ PRICE

at **FIELD TOOL SUPPLY CO.**

**Industrial Cutting Tools**  
33 S. DESPLAINES ST., CHICAGO 6, ILL.  
All Phones: Financial 6-1195

**The Largest Stock of  
Special and Standard  
Taps, Dies, Plug Gages**

**For more data circle 342 on Postpaid Card**

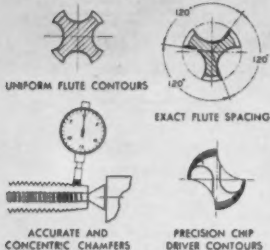


*spiral pointed  
taps  
by*



**WINTER**

**WITH BALANCED ACTION**



CALL YOUR  
WINTER DISTRIBUTOR



Winter Spiral Pointed Taps are recommended for almost every type of through-hole tapping. Short Flute Spiral Pointed Taps provide increased strength and rigidity for tapping thinner sections in soft, stringy materials.

Exclusive Balanced Action is built into every Winter Tap by painstaking attention to manufacturing detail. This inherent 'plus-value' is your guarantee of top performance from Winter Spiral Pointed Taps, as well as lower cost-per-hole.

Specify Winter Brothers Balanced Action Taps . . . the best tools available for every tapping job, every material.

**WINTER BROTHERS COMPANY**

ROCHESTER, MICHIGAN, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Chicago • Dallas • San Francisco • Los Angeles

**CHOOSE FROM WINTER'S WIDE LINE OF TAPS, DIES AND GAGES**





# National

*self-thinned  
heavy duty  
drills\**

*tools plus...*



The engineering staff at National is constantly alert to the needs of industry for tools that save time, lower costs. Patented self-thinned heavy duty drills are a specific example of this conscientious research program. Thinning operations have been built right into flute contours to save time when resharpening and maintain contour accuracy throughout the long, usable life of the drill.

Self-thinning heavy duty drills are available in a wide range of stock sizes at established list prices from your National Distributor.

For lower metal-cutting costs, specify National, the tools plus!



TWIST DRILLS • REAMERS  
COUNTERBORES • END MILLS  
MILLING CUTTERS • HOBS  
CARBIDE AND SPECIAL TOOLS

## NATIONAL TWIST DRILL & TOOL COMPANY

ROCHESTER, MICHIGAN, U.S.A.

Distributors in principal cities. Branches in New York • Detroit • Chicago • Dallas • San Francisco • Los Angeles



CALL YOUR  
NATIONAL DISTRIBUTOR

\* JUST ONE OF NATIONAL'S PARADE OF PLUS PRODUCTS





# REDUCE

... with Barber-Colman

You can't measure hob or cutter costs by purchase price alone. To find true cost, add time and labor on sharpening machines, plus losses incurred by improper sharpening. Figuring them this way quickly proves that your best opportunity to save money is by doing a better sharpening job. Barber-Colman automatic sharpeners will do this for you, and reduce costs *four* ways:

1. *Tool depreciation cost*—Accurate index sharpening distributes wear evenly over all cutting teeth, avoids excessive stock removal to recondition tools. It permits you to maintain original accuracy and thereby reduce rejects. Fine finish, with wet grinding and our new automatic wheel dressers, reduces tool wear due to friction and chip welding. Result—you get a greater number of acceptable pieces for every dollar you spend on tools.

2. *Sharpening cost*—Have you given much thought to hidden costs like this? Sharpening is a major addition to tool cost, and one of the first places to look when your costs seem high.

Barber-Colman's new sharpeners feature automatic wheel dressing. They give you positive control over cost and quality. You never have to stop sharpening to dress a wheel because the machine *dresses as it sharpens*.

Variable table speed and stroke reduce both setup and sharpening times. One man easily can operate several machines and produce high-quality work. High cost of finger sharpening can be avoided with a method that is fast and accurate.

3. *Inspection cost*—Automatic sharpening reduces the need for inspecting each hob or cutter. Spot-checking to avoid setup mistakes is all you need to maintain quality.

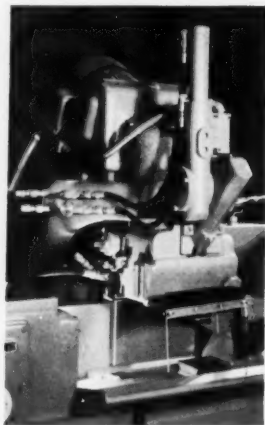
4. *Tool change cost*—Another major cost is downtime on your hobbing or milling machines to change tools. This can be minimized if improved sharpening will increase the number of pieces produced between grinds.

This sums up the approach by which you can make expensive cutting tools worth more to you today in terms of total cost per piece.

## Automatic dressing key to improved sharpening

Almost everything you do on a hob or cutter sharpener can be improved by Barber-Colman's new automatic dresser—available on Nos. 4-8, 6-5, and 10-12 machines.

Your sharpening speed, accuracy, finish, wheel wear, and diamond life are controlled positively. The human element is removed from the fine art of dressing. Even spark-out is controlled automatically. This assures consistent accuracy, fine finish, and more work per man-hour. One operator easily can keep several machines busy because he is freed from the responsibility of attending the



# TOOL COSTS

## Automatic Sharpeners

wheel. Loading and heat-checking are controlled for him. Here's how automatic dressing works:

The hydraulically actuated dresser arm operates continuously as the machine sharpens. The operator never stops the cut to dress a wheel. The wheel feeds into the diamond a predetermined amount before each dressing cycle. Amount of infeed and speed of the dresser arm control finish. Both are infinitely variable. This permits you to obtain the best combination of sharpening speed and finish for any tool.

The machine goes into its spark-out cycle after preset stock removal has been reached. Number of hob

and cutter revolutions during spark-out also can be preset, thus providing a fully automatic operation.

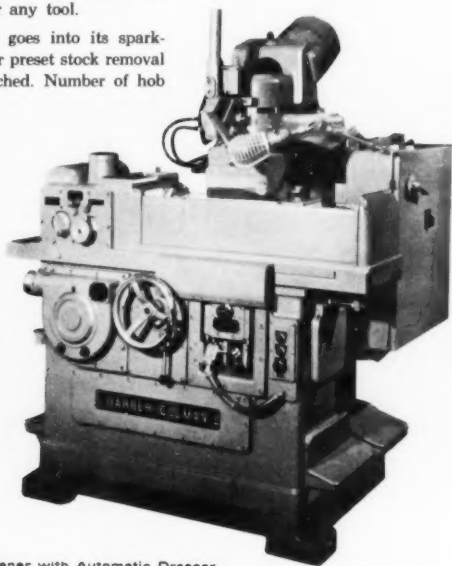
### New No. 4-8 sharpening machine speeds operation

If you are sharpening hobs, thread mills, or form cutters up to 4" diameter by 4" face width on old-style automatic sharpeners or cutter grinders, here is a machine that will cut costs *in half*.

The new Barber-Colman No. 4-8, with maximum table stroke of 10 3/4", will sharpen two 4" cutters simultaneously. It offers all of the latest advances in design, such as:

1. Automatic wheel dressing
2. Wet or dry grinding
3. Automatic spark-out
4. Quick-change arbors
5. Infinitely variable table speed and stroke
6. Rigid wheel head mounting

Call your Barber-Colman representative for assistance in setting up a sharpening program that reduces the *real* cost of hobs and form-relieved milling cutters.



No. 6-5 Sharpener with Automatic Dresser

---

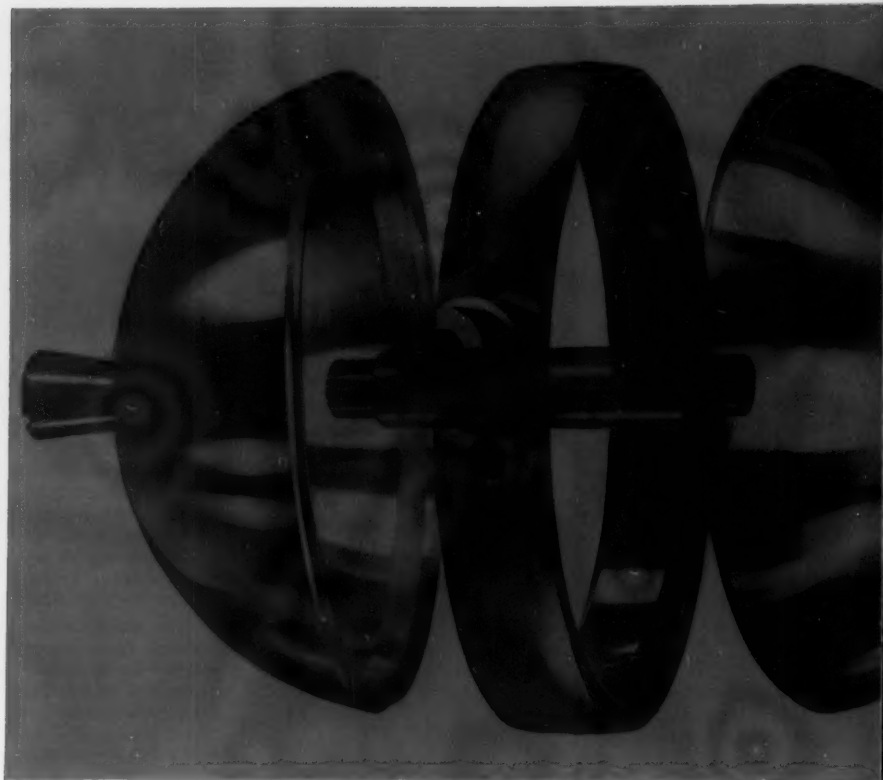
Barber-Colman Company



54 Loomis Street, Rockford, Illinois

---

For more data circle 345 on Postpaid Card



# PRECISION:

## *Reason enough*

**B**eryllium specialists, Leemath Incorporated of Long Island, create delicate and precise mechanisms in this high strength but toxic and abrasive wonder metal. In their temperature-controlled shop, this feather-light gyro float assembly (shown actual size, right) was turned on a special high-precision LeBlond Dual-Drive Lathe. *Spherocity had to be concentric with the two major axes within .0005" total indicated runout of 1.8750"!* (In order to hold the assembly that close, component tolerances had to be even tighter!)

To perform such touchy work, Leemath ordered their LeBlond 15" Dual-Drive to ultra-high precision standards. For this lathe Timken furnished specially-made bearings with one-

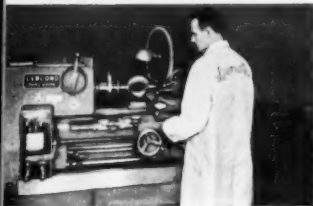
third the runout of their finest precision class. With it came the standard features that give LeBlond its reputation for long-lived precision—combination gear-belt drive headstock with 16 speeds, 31 to 2400 rpm; compensating vee bed way construction with hardened steel shears; thrust-lock tailstock; and many more.

People buy lathes for many reasons. But when, like Leemath, they must have precision they can depend upon, that is reason enough to buy LeBlond.

If you would like to have the full story of LeBlond's Dual-Drive, ask your distributor or write for Bulletin 6A.



*to buy LeBlond*



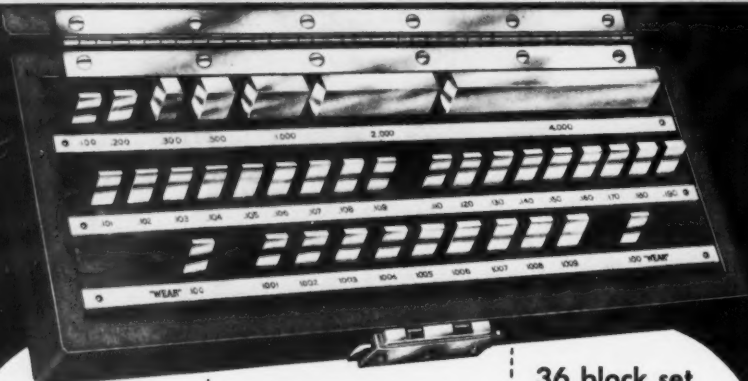
-----THE R. K. LeBLOND MACHINE TOOL COMPANY-----  
-----Cincinnati 8, Ohio-----

For more data circle 346 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 39

# Webber Announces . . . a NEW Gage Block Set, at a NEW LOW PRICE



A + Grade  
accuracy  
+ .000004"  
- .000002"

**\$157<sup>50</sup>**

36 block set  
size range:  
.100" to 4.000"  
plus two .100"  
Crobblox Wear  
Blocks



Case is finest frosted walnut grain  
Melamine, with matching interior.  
(Patent Pending)

Are you one of those manufacturers who need Gage Blocks, but do not need all the blocks contained in a full size set? If so, WEBBER has solved the problem for you, with a smaller set—a useful set that will save you many dollars.

An important feature of this new set is that the blocks are A+ quality. They actually exceed U. S. Bureau of Standards or Federal Specifications for grade "A" blocks. And--they are priced even lower than the now obsolete grade "B" blocks.

Send your order now. Delay may cost you money.

When ordering specify Set No. 36 A+ Rectangular Steel.

## Webber COMPANY

12899 Trisket Rd.  
Cleveland, Ohio

# ANNOUNCING

## G-E Man-Made Diamonds for metal bonded grinding wheels

**Now available** . . . a new General Electric Man-Made diamond crystal for metal-bond application.

Extensive laboratory tests and field evaluation of the new General Electric MBG diamond demonstrate performance advantages which are certain to benefit you in your own plant. This new Man-Made diamond type was developed specifically for metal-bonded grinding.

The addition of the new MBG crystals (for metal bonding) to the RVG grade (for

resinoid and vitrified bonding) means that your wheel supplier can now furnish wheels containing G-E Man-Made diamonds in all three bonds.

Test this new Man-Made diamond in a metal-bond wheel in your own plant. Learn first hand how the superior qualities of these crystals can improve your production picture. Contact your diamond wheel supplier. Metallurgical Products Department of General Electric Company, 11109 E. 8 Mile Boulevard, Detroit 32, Michigan.

METALLURGICAL PRODUCTS DEPARTMENT

**GENERAL  ELECTRIC**

CARBOLLOY • CEMENTED CARBIDES • MAN-MADE DIAMONDS • MAGNETIC MATERIALS • THERMISTORS • THYRISTORS • VACUUM-MELTED ALLOYS

For more data circle 347 on Postpaid Card

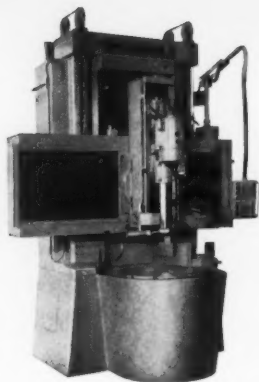
# Vertical Universal Grinders

Springfield vertical universal grinders are among the most versatile tools you can use for *both* production and toolroom work. Head is easily positioned to grind ODs, IDs, surfaces, offsets and undercuts in *any* combination, generally with one chucking. Work may be regular or irregular in shape, up to 48" high with up to 52" swing on standard machines. Weight of workpiece is no problem because gravity works for you in vertical grinding — helps achieve extreme micro-inch finish and concentricity.

A typical example of a Springfield's remarkable precision is its ability to grind taper valve plugs and seats with one angle setting of the head—and get 95% blue or better on a taper gage with surface finish smoother than 30 RMS.

For high production, sometimes involving automatic loading, cycling, size control and unloading, Springfield builds special vertical grinding machines. Most of these can be reset when part changes occur. Another area in which Springfield has pioneered is in vertical contour grinding machines that handle missile parts.

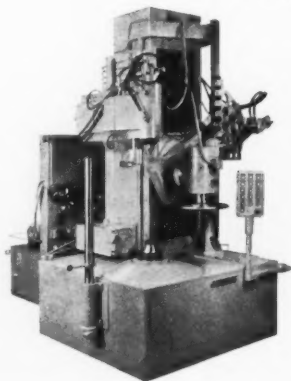
If you would like to know more about Springfield vertical grinders, please write for Bulletin 197-G.



model 3-TR  
52" swing

$MMT = pE$

*new developments coming!*



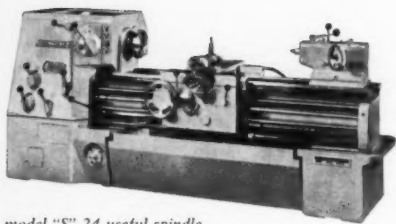
vertical  
contour  
grinder

## **SPRINGFIELD**

*The Springfield Machine Tool Company  
Springfield, Ohio*

For more data circle 348 on Postpaid Card

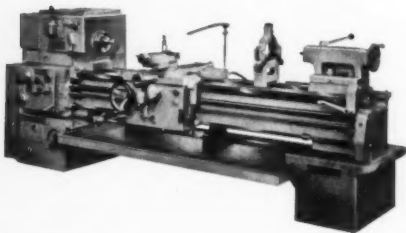




model "S" 24 useful spindle  
speeds, 66 feeds & threads  
heavy duty 16"  
medium duty 20"



*new developments coming!*



model 280 16 useful spindle  
speeds, 60 feeds & threads  
heavy duty 14", 16"  
medium duty 20"

*The Springfield Machine Tool Company  
Springfield, Ohio*

## Engine & Toolroom Lathes

Springfield lathes have 10, 15 or 20 horsepower motors for heavy cuts, and have simple, practical features that keep the operator productive and keep the maintenance man away. Pressurized mist lubricates the headstock. Only four gears are in mesh for a given speed—the others run free. Clean, functional design and simplified controls promote pride of workmanship and minimum waste motion.

Ruggedness with precision has always been characteristic of Springfield lathes—because they are built to one standard of excellence. A Springfield engine lathe meets the accuracy standards set up for toolroom lathes—without any cost penalty.

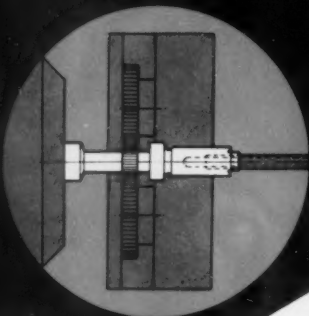
Whenever you want maximum power and efficiency, and the cost designed out by designing simplicity in, consider a Springfield lathe. A full range of attachments is available—hydraulic contouring and reproducing, plain and universal relieving, taper, etc.

If you would like to know more about Springfield lathes, please write for Bulletins 190-G and 201-G.

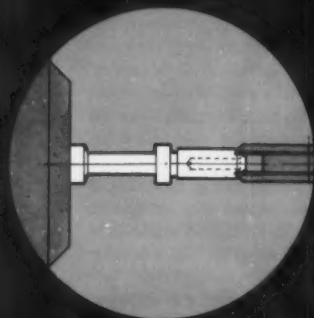
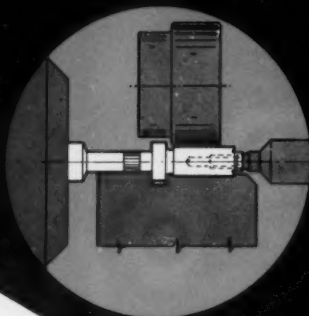
# SPRINGFIELD

For more data circle 349 on Postpaid Card

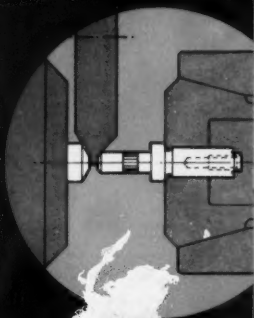
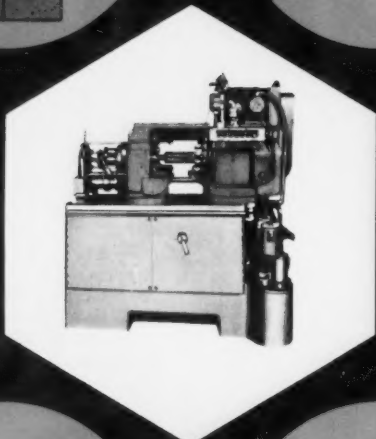
3. Start Spindle  
Tap  
Knurl



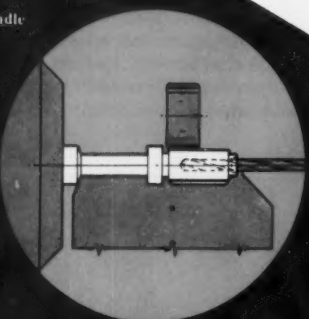
4. Shave Front and Rear Dia.  
Support in Tap Hole



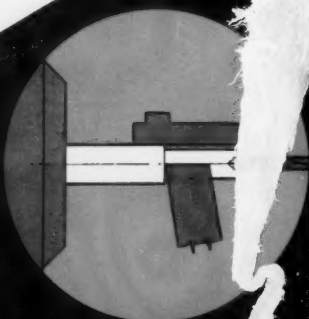
2. Stop Spindle  
Mill Flats



Pick-up  
Off  
Hammer Rear

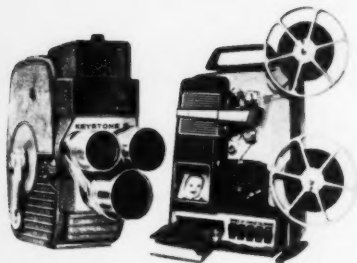


1. Form Groove and Rear Dia.  
Face End  
Drill Tap Hole



6. Turn Front Dia.  
Spot Drill  
Support

9 operations in 3.8 seconds ... one of the typical parts produced by Keystone Mfg. Co. on the RA-6 Bar Automatic



## 85,000 Pieces Per Day And No Rejects

Production facts tell a typically impressive story of Acme-Gridley machining efficiency at Keystone Manufacturing Company, Boston, Mass.

"We have five  $\frac{7}{16}$ " RA-6 Spindle Bar Automatics", states a Keystone executive. "Everyday, they produce an average of 85,000 precision parts for our cameras and projectors . . . and yet, there are literally no rejects. As a result of this consistent conformance to our tough tolerances, scrap losses have been wiped out and inspection time reduced to an all time low. What's more, because Acme-Gridleys produce in a single set-up jobs otherwise requiring secondary machining, we've cut production costs."

Dramatic and *tangible* savings like those realized by Keystone are commonplace with Acme-Gridleys. Such features as a wide open tooling zone, direct camming and independently operated tool slides can help you achieve higher mass production efficiency at lower cost. We'll be happy to supply complete information on the world's most complete line of multiple and single-spindle automatic bar and chucking machines. Call, write or wire.

National Acme's "Zone of Responsibility" includes all phases of cost reduction. Check YOURS . . . Then Check National Acme.

**Direct Costs:** these include direct dollar savings as realized by Keystone Manufacturing Co. . . . an "everyday" job for Acme-Gridleys. **Indirect Costs:** effecting important savings in maintenance, downtime, scrap reduction, tool costs, etc. **Product Redesign:** teaming with your design group to take full advantage of Acme-Gridleys' cost reducing capabilities. **Direct Material Costs:** our engineers provide important savings in this area by constantly matching machines and tools to modern metallurgical problems. **Make-or-Buy Reviews:** in many cases our Contract Division can assume your production headaches and relieve you of immediate capital investment. **Spot Modernization:** pioneering in modern tooling methods, and the flexibility of Acme-Gridleys can provide many "on-the-spot" savings.

# National Acme

The National  
Acme Company  
183 E. 131st Street  
Cleveland 8, Ohio

Sales Offices: Newark 2, N.J.; Chicago 6, Ill. Detroit 27, Mich.



For more data circle 350 on Postpaid Card

# NO DOUBT ABOUT IT...

that's why the **DIMENSIONAIR**  
is the best air gage you can buy !



#### No doubt about the Dimensionair's readings

Such sharply defined calibration—the mark of a truly accurate gage—obviously gives you greater resolution, much finer readings than broadly defined graduations and wide hands or air-suspended markers ever can. Each time you gage with the Dimensionair, the needle-thin indicating hand advances smoothly, comes to a positive stop, yet is responsive to the slightest change. Its position in relation to the fine-line graduations is unmistakable. Such decisiveness, coupled with Dimensionair sensitivity, means much greater readability. In fact, tests prove that you get more information from the Dimensionair than from other air gages having twice the magnification.

#### No doubt that the Dimensionair maintains its accuracy

Dimensionair magnification is built-in... fixed. No adjustment can change it. That's why the Dimensionair, once set, stays set. Air pressure variations cannot affect the accuracy of the Dimensionair. Its balanced air circuit cancels them out. This achieves a stability which cannot be approached by other air gages.

#### No doubt the Dimensionair is easiest to use

Its fixed calibration and protection against drift guarantees linear, calibrated accuracy so you need only one master for set-up... make only one adjustment to set zero. You're ready to gage in less than ten seconds... no juggling high and low limits as with other air gages. Dimensionair design gives you wide range operation (up to .006" depending on model selected).\*

All these advantages are yours because the Dimensionair, unlike other air gages, is built to a specific accuracy and magnification. But don't just take our word for it... see for yourself. We shall be glad to demonstrate the Dimensionair to you.

#### \*FIVE MAGNIFICATIONS TO CHOOSE FROM:

1,250:1 (.006" range, each grad. = .0001")
2,500:1 (.003" range, each grad. = .00005")
5,000:1 (.0015" range, each grad. = .00002")
10,000:1 (.0006" range, each grad. = .00001")
20,000:1 (.0003" range, each grad. = .000005")

**FEDERAL PRODUCTS CORPORATION**  
6145 Eddy Street • Providence 1, R. I.

#### Yours for the asking ! "DIMENSIONAL GAGING WITH AIR"

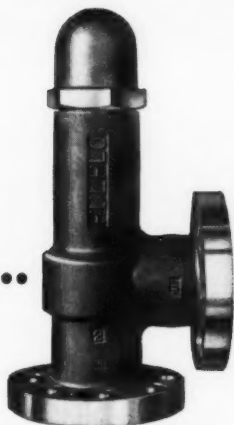
A truly educational film—16 mm, 40 minute, color—outlines the basic principles of air gaging—shows applications. A must for anyone involved with dimensional control. Puts the value of air gaging in the proper perspective. Write for reservation.

For more data circle 351 on Postpaid Card

Ask **FEDERAL** First

FOR RECOMMENDATIONS IN MODERN GAGES . . .

Dial Indicating, Air, Electric, or Electronic—  
for Inspecting, Measuring, Sorting, or Automation Gaging



**EXTRA  
SAFETY  
EXTRA  
SERVICE**

**fulflo  
VALVES**

## **ALL STEEL** **for positive AUTOMATIC PRESSURE CONTROL**

The combination of FULFLO Valve design with ALL-STEEL construction is outstanding when you're looking for safe, trouble-free and quiet operation in any hydraulic system.

FULFLO design offers shear-closing action to eliminate chattering; sliding piston for full flow opening; easy adjustment within the pressure range or change of the pressure range.

ALL-STEEL construction adds extra safety, maximum protection against fire or mechanical damage demanded by hydraulic designers and users . . . to the advantages proved by literally thousands of FULFLO all-brass or stainless trimmed valves.

Whatever your requirements . . . for O.E.M. use or replacement service . . . there's a FULFLO Valve designed just right, built right and priced right.

- Screw or flange models . . . to 500 lbs. . . . pipe sizes to 3"
- Steel, cast or brass bodies . . . brass, steel or stainless trim
- Just 6 springs for complete range of pressures
- Fast shipment of standards . . . specials to your requirements

### **Need a "special"?**

FULFLO can engineer a special valve to your most exacting specifications . . . and deliver faster than you may think possible.

**FOR COMPLETE INFORMATION,**  
request a copy of 1960 FULFLO Valves Mechanical Data Book.



**THE FULFLO SPECIALTIES CO., INC.**

216 Fancy Avenue

Blanchester, Ohio

For more data circle 352 on Postpaid Card



## HOUR OF DECISION

**After hours? — sure** You're not surprised at that because you know it's when he (and probably you, too) concentrates on the problems which are vital to his company's continued successful growth. The day is filled with production crises, maintenance problems, personnel questions, and committee meetings. It's only now that he can really study the facts and decide what's best.

Right now he's reviewing his machine tool inventory. He's amazed at how old some of his equipment is getting to be. It seems only yesterday that he signed the purchase order for it to increase his capacity for World War II. But that was 1943, seventeen years ago! No wonder maintenance is getting high and efficiency is dropping off.

We've got a suggestion for this man (and for you, too). Attend **THE MACHINE TOOL EXPOSITION — 1960** and see for yourself why Modern Machine Tools = Production Efficiency. This exhibit, the first since 1955, is sponsored by The National Machine Tool Builders' Association\* and will contain eleven acres of the U.S.A.'s newest machine tools under power, cutting and forming metal to demonstrate 1001 ways to lower production costs. Can you afford to stay home?

You're also invited to the **PRODUCTION ENGINEERING SHOW** on the Navy Pier.

No extra registration needed.

\*The N.M.T.B.A. represents 90% of the U.S.A. machine tool industry.

FORMULA FOR TOMORROW

For more data circle 353 on Postpaid Card



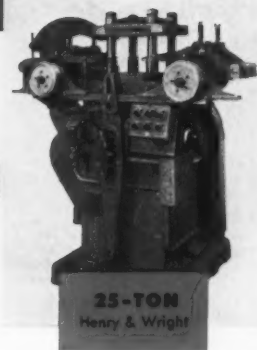
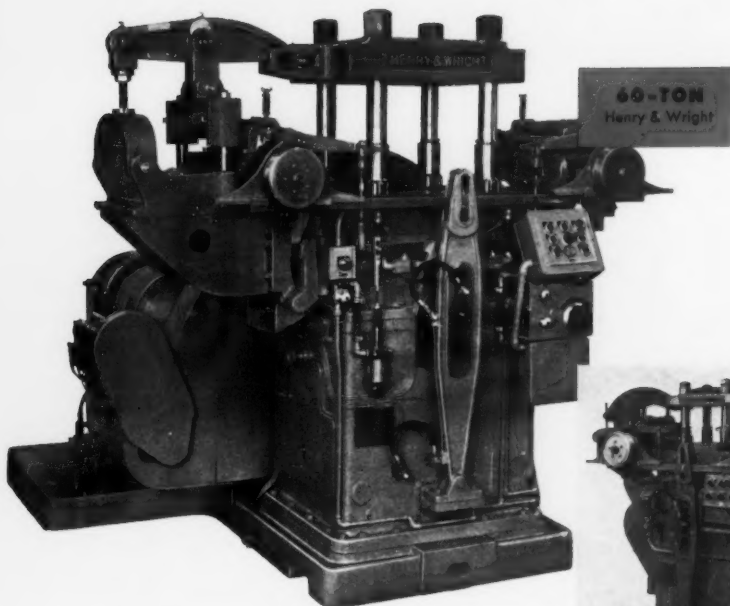
International  
Amphitheatre  
Chicago, Illinois  
Sept. 6-16

# THE MACHINE TOOL EXPOSITION — 1960

For information write to

NATIONAL MACHINE TOOL BUILDERS ASSOCIATION

2139 Wisconsin Avenue, N.W. • Washington, D. C.



## These Henry & Wrights Do What 5 to 10 Conventional Presses Do- *More Quickly*

Over 3000 Henry & Wright Dieing Machines in service today, attest to the popularity of one of our earliest forms of automation. They were born to the mass production industry almost before it started. Every model employs the same basic design principles. A low center of gravity with all driving elements below the die bed assures stability for high speed operation. Precision alignment is provided by the long guiding surfaces; a pulling stroke rather than a pushing force gives better control; angular thrust of crankshaft is absorbed by lower crosshead instead of by slide

or punch. These and many other features assure maximum die life, at higher speeds, with more profit for you.

These high production units can replace the work of several conventional presses cutting labor costs proportionately. Modern progressive dies can produce virtually any shape, with any material, simpler and faster. Let H-P-M engineers adapt Henry & Wrights to your next mass production problem. Take advantage of less operating cost, reduced amount of floor space required, greater production output.

**THE HYDRAULIC PRESS MANUFACTURING COMPANY**

A Division of Koehring Company • Mount Gilead, Ohio, U.S.A.



For more data circle 354 on Postpaid Card





## AIR GAGE READINGS RECORDED AUTOMATICALLY

New Sheffield pneumatic gage recorder automatically records size variations during *continuous* or repetitive air gaging. Gives your customers part size certification. Eliminates tally sheets and other less efficient practices. Records deviations from specified part size on 4" wide chart. Full scale range is from  $\pm 0.0003$ " to  $\pm 0.04$ " with back pressure type tooling. Chart travel is continuous or indexing. Chart calibrations are uniformly spaced with 5, 10, 15 or 30 divisions each side of center zero. Controls are virtually tamper-proof. Write Dept. 12 for Bulletin PGR.

The

# **SHEFFIELD**

Corporation

Dayton 1, Ohio

*A subsidiary of the Bendix Aviation Corporation*  
Gages, Measuring Instruments, Automatic Gaging &  
Assembly Systems • Machine Tools • Contract Mfg.

For more data circle 355 on Postpaid Card



**HOW MUCH COULD YOUR SHOP PRODUCE IN A TWO HOUR DAY...  
...LESS A COFFEE BREAK?**



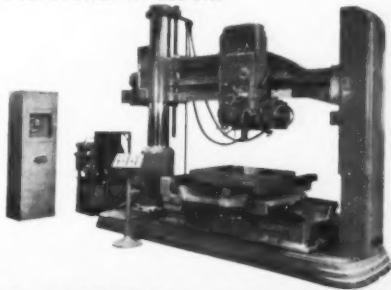
Almost as much as you now produce in 8 hours with conventional equipment! When you switch to an AMERICAN numerically controlled Positioning Table and the new AMERICAN Hole Wizard Radial Drill, your production will step up 400%!

In addition to fast, error-proof positioning to  $\pm .000250"$ , the AMERICAN positioning table gives you extreme ease of operation. The simply loaded punched tape is read by low pressure air, and automatically moves the table to first position at the touch of a button. After that, your operator need only touch the "Next Position" button on the portable console.

This rugged, profit-making combination was designed by American Tool Works and Sperry Gyroscope engineers to increase your production, eliminate expensive jigs, prevent operator error.

Ask your American Distributor about "Toollease," our leasing plan under which this AMERICAN Positioning Table and AMERICAN Hole Wizard Radial combination can improve your production... while it pays for itself. Or, write Section 163 at the address below.

Ask for Bulletins 700 and 801.



**THE AMERICAN TOOL WORKS COMPANY**

PEARL STREET AT EGGLESTON AVENUE • CINCINNATI 2, OHIO

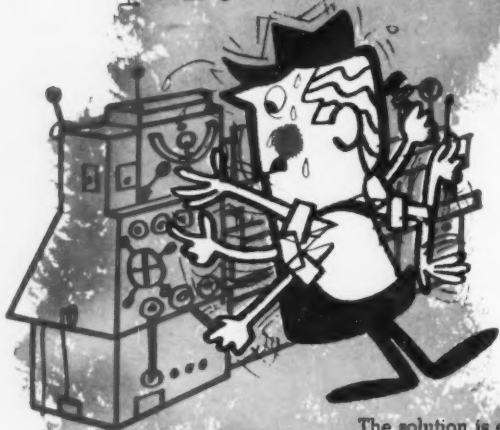
For more data circle 356 on Postpaid Card

# STOP

these men  
from  
stealing your  
profits.....

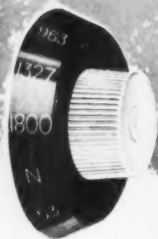


You know about this fellow . . .  
he's stealing "cash", and you  
do try to stop him.

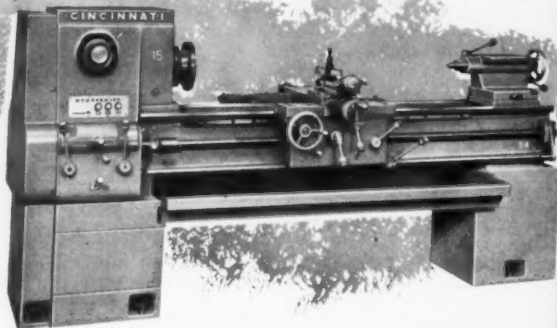


But **YOU** cause this theft . . .  
you force this man to  
steal your profits . . .  
make him add to labor and  
burden costs on most lathe  
jobs, no matter how hard  
he works.

The solution is easy:  
make your operator a *cost-reducer* on **ALL** of his lathe  
jobs—shift him to **HYDRASHIFT**\* Here's why . . . . .



\*HYDRASHIFT is Cincinnati's  
new lathe line with the new  
way to change spindle speeds  
. . . hydraulically!



Compare the machining of this typical lathe job,  
two steps  
and two necks  
on the new HYDRASHIFT . . . on a conventional lathe



As second step is being cut, operator turns the dial to speed required for the necking cut.



Operator waits for machine to complete the step cuts.



Step cuts completed, operator changes to necking tool (he had it lying on the convenient Tray-Tap) and positions tool for cut.



Step cuts completed, operator changes to necking tool and positions tool for cut.



Operator engages spindle lever and cuts the neck—without leaving apron.



Operator goes to headstock, shifts various levers to change to spindle speed for necking cut.



Necking cuts completed, operator changes tools for next workpiece.



Operator returns to apron, engages spindle lever, and cuts the neck.

Don't force your lathe operators to steal profits from your pockets—take a look at the new Cincinnati HYDRASHIFT Lathes at your nearby Cincinnati Lathe and Tool Dealer's showroom. If you can't reach him immediately, wire collect!



CINCINNATI LATHES AND TOOL CO. CINCINNATI 9, OHIO

HYDRASHIFT Lathes CINCINNATI Drilling Machines SPIROPOINT Drill Sharpeners

For more data circle 357 on Postpaid Card

May, 1960

MODERN MACHINE SHOP

53



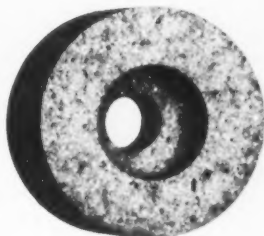
for speed and accuracy in production  
it pays to use UNIVERSAL DRILL BUSHINGS

UNIVERSAL ENGINEERING COMPANY • FRANKENMUTH 9, MICH.

For more data circle 358 on Postpaid Card



## POSITIVE DUPLICATION—EVERY TIME!



One animal makes tracks like these, a pattern that is positively duplicated only by the grizzly bear. And only Cincinnati offers you the Positive Duplication of these INTERNAL WHEELS, and of *all* CINCINNATI ® GRINDING WHEELS.

### HOW WE ACHIEVE "PD"

To produce these grinding wheels of unsurpassed uniformity, Cincinnati developed a unique manufacturing process. It involves 36 separate quality controls, from formula blend to final inspection. For example, cams for temperature control of drying ovens must pass regular tests for accuracy, and checking procedures never vary.

### HOW UNIFORMITY HELPS YOU

One big advantage of CINCINNATI ® WHEELS is—longer wheel life. Cut the need for frequent wheel changes, and you boost production. Using ® WHEELS you can plan production schedules with the assurance

that each reorder wheel will act and grind exactly like the original. This is the promise—and *performance*—of Positive Duplication.

### CUT COSTS . . . CALL CINCINNATI

You can solve your grinding problems with the help of Cincinnati's factory-trained specialists. Their wide experience in job set-ups and grinding operations is at your service. Just call your CINCINNATI ® GRINDING WHEEL Distributor, or contact Cincinnati Milling Products Division, Cincinnati 9, Ohio.



\*Trade Mark Reg. U.S. Pat. Off.

A PRODUCTION-PROVED PRODUCT OF THE CINCINNATI MILLING MACHINE CO.

For more data circle 359 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 55

## INSTANT KEYWAYS



for a penny apiece

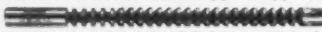
With Minute Man Keyway Broach Kits you can cut keyways in one minute for as little as one cent. For keyways from  $\frac{1}{16}$ " to 1" in any bore from  $\frac{1}{4}$ " to 3".

### SAVE TIME WITH THESE OTHER STANDARD STOCK BROACHES

*Minute Man*®

 SQUARE BROACHES  $\frac{1}{8}$ " to  $\frac{3}{4}$ " holes

 HEXAGON BROACHES  $\frac{1}{8}$ " to  $\frac{3}{4}$ " holes

 ROUND BROACHES  $\frac{1}{8}$ " to 1" hole

### SEND FOR CATALOG AND PRICE LIST

The duMont Corp.,  
Greenfield, Mass.

MAIL FREE BROACH CATALOG AND  
PRICE LIST S describing Square Broaches,  
Hexagon Broaches, Production Type Keyway  
Broaches and Keyway Broach Kits to

Name .....

Company .....

Address .....

duMONT

For more data circle 360 on Postpaid Card

56 MODERN MACHINE SHOP

## Meetings

### Important Meeting Dates

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

**MAY 7-10** • National Tool and Die Manufacturers Association, Spring Meeting, Statler-Hilton Hotel, Washington. Association headquarters: 907 Public Square Bldg., Cleveland 13, Ohio.

**MAY 9-12** • Instrument Society of America, Instrument-Automation Conference and Exhibit, Civic Auditorium and Brooks Hall, San Francisco. Society headquarters: 313 Sixth Ave., Pittsburgh 22, Pennsylvania.

**MAY 9-13** • American Foundrymen's Society, Castings Congress and Exposition, Convention Hall, Philadelphia. Society headquarters: Golf and Wolf Rds., Des Plaines, Illinois.

**MAY 9-13** • American Society for Metals, Southwestern Metal Congress and Exposition, State Fair Park, Dallas. Society headquarters: Metals Park, Novelty, Ohio.

**MAY 11-14** • Machinery Dealers National Association, Annual Meeting, Edgewater Beach Hotel, Chicago. Association headquarters: 1346 Connecticut Ave., N. W., Washington 6, D. C.

**MAY 23-25** • Triple Industrial Supply Convention, Conrad Hilton Hotel, Chicago. Information: W. B. Thomas, Thomas Associates, Keith Bldg., Cleveland 15, Ohio.

**MAY 23-26** • Design Engineering Show and Conference, Coliseum, New York. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, New York.

**MAY 24-26** • American Society for Quality Control, Annual Meeting and Exhibit, Sheraton-Palace Hotel, San Francisco. Society headquarters: 161 W. Wisconsin Ave., Milwaukee 3, Wisconsin.

**SEPTEMBER 6-16** • National Machine Tool Builders' Association, Machine Tool Exposition, International Amphitheatre, Chicago. Information: Clapp & Poliak Inc., 341 Madison Ave., New York 17, New York.

May, 1960



# APEX



**HORIZONTAL HYDRAULIC  
BROACHING MACHINE**

## **APEX HORIZONTAL BROACHING MACHINES**

**The Ultimate in Modern Engineering Design and Performance**

**BROACH HOLES OF ANY SHAPE** — round, square, hexagonal spline, oval, as well as keyways and cams.

**IDEAL FOR SURFACE BROACHING** — when equipped with proper fixtures and tools, tailored to your application by the experienced APEX engineering staff.

**STURDY, PRECISION CONSTRUCTION** — Ruggedly built to stand the rigors of continuous production.

**HIGH CAPACITY** — Peak capacity on every model is full 40% above normal capacity.

Write for specifications or phone

## **APEX BROACH COMPANY, INC.**

### **MACHINE DIVISION**

6401 E. Seven Mile Rd.

TWinbrook 1-8600

Detroit 37, Michigan

For more data circle 361 on Postpaid Card

For every foundry —

*Norton Foundry News*

**NORTON**

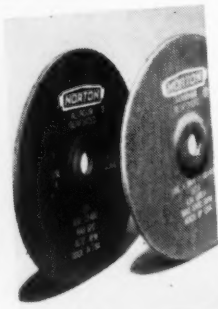
## BETTER SNAGGING WHEELS!



B11 Wheels



BN Wheels



BD Wheels

Equipment and quality control in new, multi-million  
dollars — maintaining

*Norton Foundry News*

## BIG NEW PLANT FOR RESINOID WHEELS!



*best news in years!*

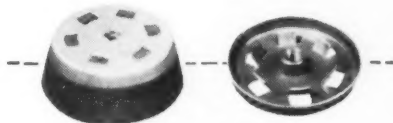
## *Norton Resinoid Wheels Now Better Than Ever*

The great new Norton Worcester Plant No. 8 was built specifically to advance the manufacture and performance of resinoid wheels — the wheels foundries need most and use most.

Equipment and quality control in new, multi-million dollar Plant No. 8 are ultra-modern — maintaining "Touch of Gold" performance at highest efficiency and producing resinoid wheels that remove more metal per dollar and last longer. For example:

- B11 resinoid bonded wheels have more uniform structure and better balance, assuring faster, cooler grinding, plus smoother operation. Available in sizes and types for all jobs — on your swing frame grinders and floor stands down to smallest portables.
- BN and BNA straight wheels, reinforced with glass cloth, are strong and safe, excellent for cutting and notching gates and risers. Made in thinnesses down to  $\frac{1}{16}$ " and  $\frac{1}{32}$ ".
- BD and BDA wheels, raised hub type, glass-nylon reinforced, are ideal for many cleaning, slotting and cutting operations.

On-the-job reports of how new Norton resinoid wheels are paying off in ferrous



**Small Cup Wheels . . .  
Lots of Safety**

Built-in reinforcement is available in Norton cup wheels of standard size  $6/4 \frac{3}{4} \times 2$ ". The new steel cup bushing, molded firmly into the wheel back does not replace a wheel guard but does provide additional safety — another valuable feature of Norton portable wheels that do more work with less operator-fatigue.

and non-ferrous foundries are in the new report, Norton High Speed Resinoid Wheels for the Foundry, shown here. Your free copy is available from your local Norton Representative . . . and is as near as your phone. Call for it today.

NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.



**NORTON**  
A B R A S I V E S

W-1967

75 years of . . . Making better products . . . to make your products better

**NORTON PRODUCTS:** Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals

**BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

For more data circle 362 on Postpaid Card



- ELIMINATE DELAYS!
- KEEP YOUR OPERATING COSTS WHERE THEY SHOULD BE!



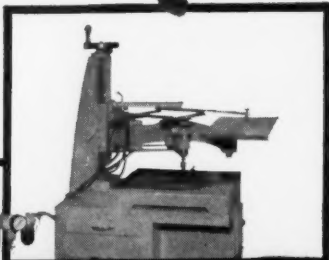
#### PORTABLE 40-POUND BENCH MODEL 106

Here is a speedy, economical 2 or 3-dimensional engraver used by thousands of dollar-conscious companies. It features 5 positive, accurate pantographic ratios; ball bearing spindle with 3 speeds up to 14,000 rpm. Is supplied with one copy carrier that accepts all standard master type sizes. Will actually work up to 10" by any width. Height of pantograph and position of cutter are continuously adjustable.

#### MODEL D-2 HEAVY-DUTY 2-DIMENSIONAL

Pantograph for milling,  
drilling and engraving.

Vertical adjustment of copy table automatic with Pantograph. Features: unobstructed on 3 sides to take large work; micrometer adjustment for depth of cut; ball bearing construction throughout; spindle speeds up to 26,000 rpm for engraving or machining; vertical range over 10"; ratios 2 to 1 to infinity — master copy area 26" x 10"



#### NEW MODEL D2-201 PNEUMATIC ATTACHMENT

for use with Model D2 Pantograph Engraver to rapidly drill holes in printed circuits by tracing templates. Drills as many as 100 holes per minute. Equipped with foot switch, spindle air cylinder, regulating valve and pressure gauge, filter and oiler. It's ready to use as soon as it's attached to an air compressor.

Write or call for full  
details and prices.

### GREEN INSTRUMENT COMPANY, INC.

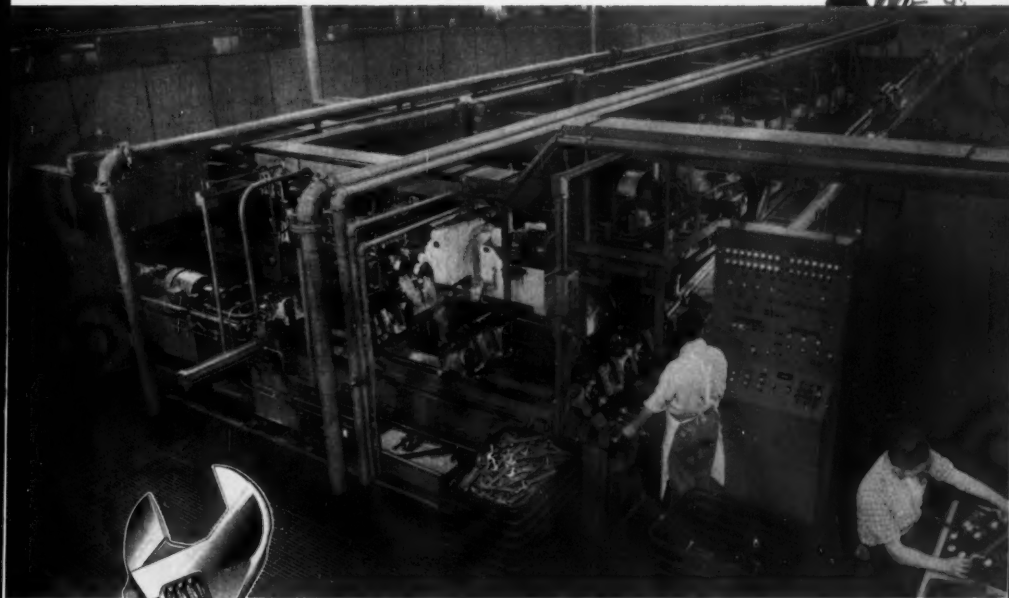
Dept. 392, 295 Vassar St., Cambridge 39, Mass. Tel. ELiot 4-2989

For more data circle 363 on Postpaid Card

# It's a Push-Button World at WILLIAMS

that's why **SUPERJUSTABLES®**

**WORK BETTER • LAST LONGER**



● **AUTOMATED MACHINING** guarantees smooth adjustment, exact fit in every wrench. This million dollar transfer machine was designed especially for Williams' Superjustable® wrench production. A push of a button puts 28 stations in operation...consistently machining to uniformly close tolerances. Fully machined wrench heads are constantly checked on special gauges to further insure perfect fit with sliding jaws, worms, pins and springs. No other manufacturer has this automated equipment to so precisely machine wrenches that *work better...last longer.*



Send for New Catalog No. 304. Lists over 4530 Stock Wrenches, Tools and Forgings... the Broadest Line of its kind.



**J. H. WILLIAMS & CO.**

DIVISION OF UNITED-GREENFIELD CORPORATION

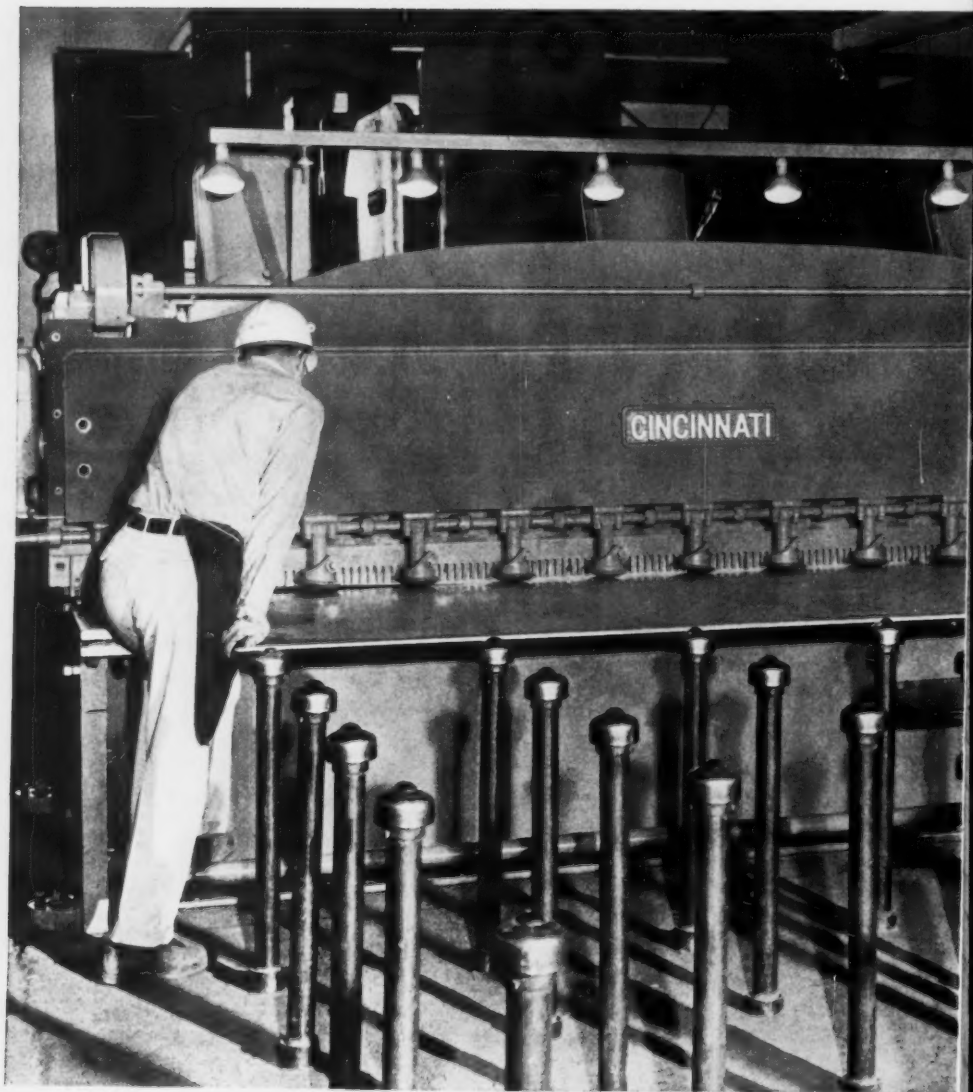
412 VULCAN STREET • BUFFALO 7, NEW YORK

**TOOLS of INDUSTRY**

Superjustables® are available in regular or locking styles in sizes ranging from 4 to 24 inches, Black or Chrome finish.


For more data circle  
364 on Postpaid Card

# Maintenance



# negligible

## ON 6 YEAR OLD CINCINNATI® SHEAR



"We have had this Cincinnati Shear in almost constant operation for something over six years," says S. L. Cate of Bannock Steel Company, Pocatello, Idaho, "and, to date, our maintenance costs have been almost negligible."

"We certainly feel that this is truly a remarkable performance."

Bannock Steel Company recently installed a new Cincinnati Hydraulic Press Brake—clear evidence of their confidence in the Cincinnati line.

See our insert in Sweet's Machine Tool file.

*Courtesy Bannock Steel Company*

Shapers / Shears / Press Brakes

THE **CINCINNATI**



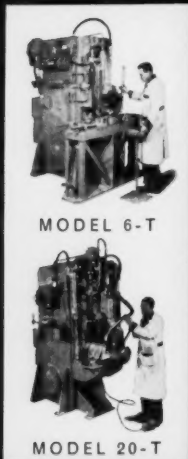
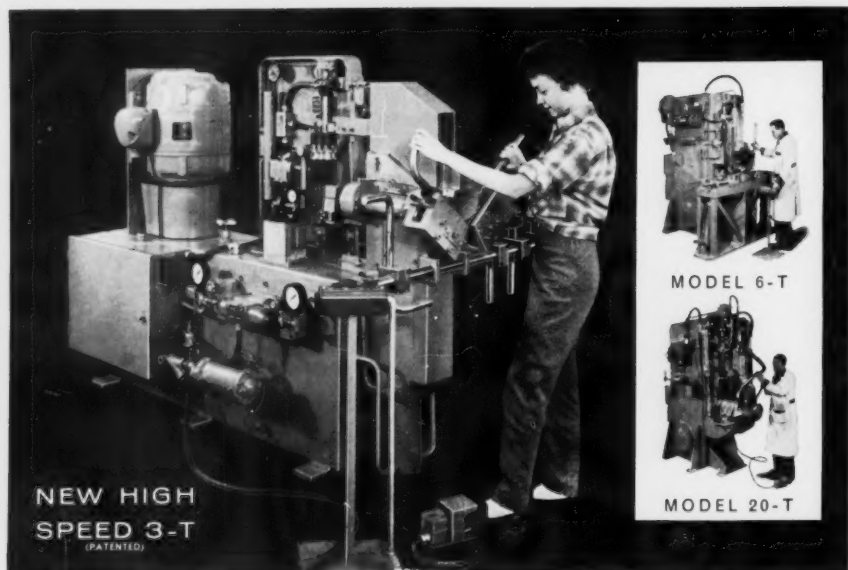
**SHAPER** co.

Cincinnati 11, Ohio, U.S.A.

In Scotland: The Cincinnati Shaper Co., Ltd., Glasgow

For more data circle 365 on Postpaid Card





## *More Profitable Bending* REPORTED FROM INCREASED PRODUCTION, BROADER FLEXIBILITY, FASTER SETUP...

... ON NEW PINES HIGH SPEED MODEL 3-T PRESS. This new progressive bending press has proven the key to increased production, reduced costs on a variety of jobs in such industries as automotive, furniture, appliance, and farm equipment.

"INCREASED PRODUCTION"... reported by Hunting Co., Inc., Philadelphia. Accurate, quality bends are produced on the 3-T three times faster than by conventional methods. Speeds up to 1500 bends an hour on tubular parts up to 1" O.D.

"BROADER FLEXIBILITY"... says Kalamazoo Furniture Company, Kalamazoo, Michigan. Wide open tooling area permits rapid progressive bending in varied planes. Up to 10 different bend angles are automatically produced in a single setup with maintained plus or minus 1/2 degree accuracy.

"FASTER SETUP"... reported by Configured Tube Products, Bellwood, Illinois. Pick-out pins in indexing turret permit quick bend angle selection, are easily stored with stop gauges for repeat work. Quick change tooling contributes to fast, 15 minute setups.

... ON MODEL 6-T PRESS. At Chromcraft Corporation, St. Louis, this multiple bending press saves time simultaneously forming "U" frames in two and three tubes per cycle at speeds up to 2000 bends an hour.

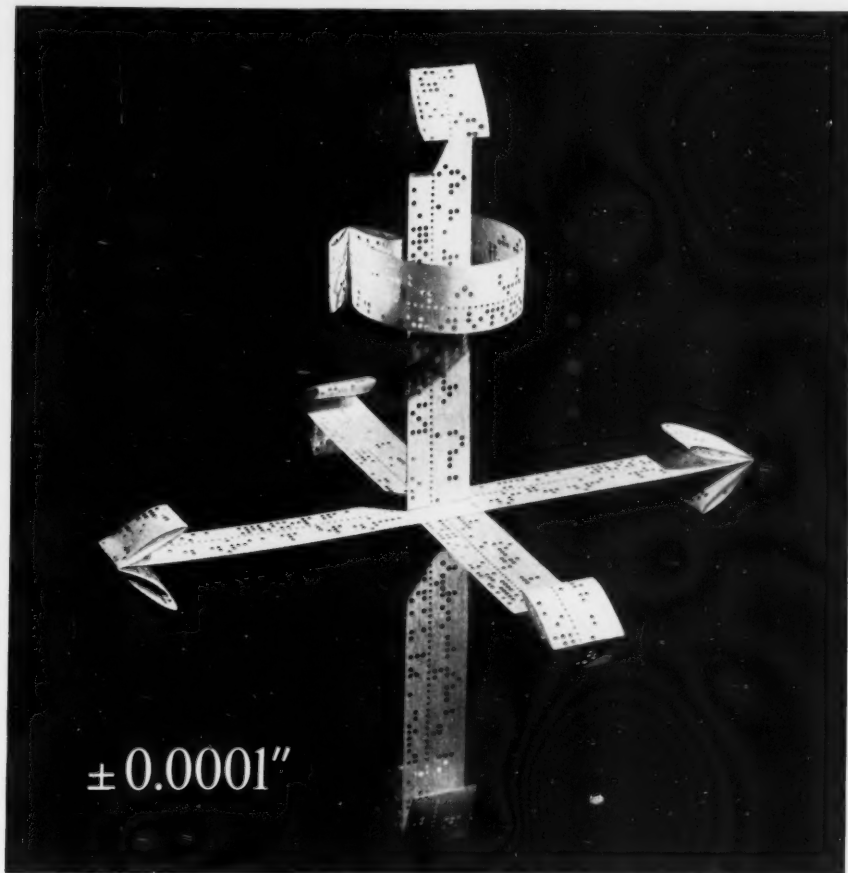
... ON MODEL 20-T PRESS. At The AP Parts Corporation, Toledo, progressive bending of tubes up to 2" O.D. has increased efficiency 20% with speeds up to 800 bends an hour and near elimination of pass-along work-handling.

Get the complete profit story today. Write for New Catalog 379  
on Pines Bending Presses

**PINES** ENGINEERING CO., INC.  
Specialists in Tube Fabricating Machinery 646 WALNUT • AURORA, ILLINOIS

PRODUCTION BENDING • DEBURRING • CHAMFERING MACHINERY

For more data circle 366 on Postpaid Card



$\pm 0.0001''$

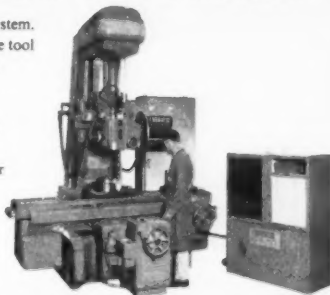
## PRECISION BORING: Control gains a Third Dimension!

Now Fosdick adds Numerical Depth Control to its unique positioning system. Another loophole for error in precision boring has disappeared. Watch the tool drive smoothly to depth, boring a hole with finer finish, precise in depth and location. Watch the tool advance and retract quickly, saving time. *Tape or dial any depth. Absolutely no stops to preset.*

See how this control signals every tool change and compensates for tools of random length. It was planned when the Fosmatic precision boring machines were designed, so that it fits and takes no extra space. Consider what this new dimension in control means to your critical production jobs. Write for catalog PB-W.

**FOSDICK**

THE FOSDICK MACHINE TOOL COMPANY  
Cincinnati 23, Ohio



For more data circle 367 on Postpaid Card

May, 1960

MODERN MACHINE SHOP

65



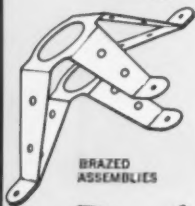
METALLIC GASKETS



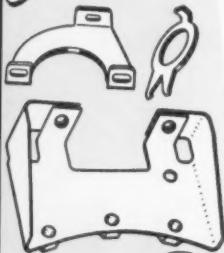
LOCK WASHERS



BENCH ASSEMBLIES



BRAZEN ASSEMBLIES



MS CLAMPS



TAB WASHERS

# Superb Stampings



from the simplest, tiny washer

to precision  
stamped  
Rocker Arms



— and everything in between! —

We deliver superb stampings . . . anything from hub caps for baby carriages to vane locks for aircraft turbines—with tolerances well within the accepted standards of those industries.

Point is, we deliver *exactly* what you want. *That's* why we say our Stampings are "superb". You'll say it, too.

How do we do it? By applying the best of our own three Methods: the "ONE PLUS" METHOD avoids tooling charges . . . the SHORT RUN METHOD employs our own temporary tooling . . . the PRODUCTION RUN METHOD uses special dies at nominal cost.

Either way, you get exactly the Stampings you need—faster, better, and at surprisingly low cost. Our routine WATCH DOG SERVICE sees to *that*.

QUANTITY? Anything from one to a million!

# Stampings

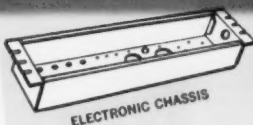
DIVISION



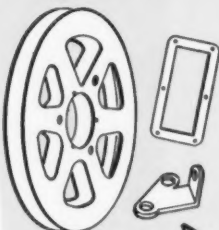
THE LAMINATED SHIM COMPANY, INC.  
3305 UNION STREET, GLENBROOK, CONNECTICUT

Interesting STAMPINGS FOLDER NO. 3 contains helpful information for ordering Stampings most economically. Send for your copy. No obligation.

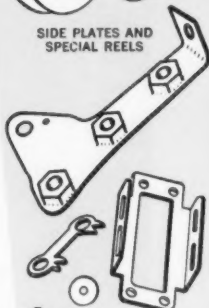
For more data circle 368 on Postpaid Card



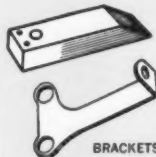
ELECTRONIC CHASSIS



SIDE PLATES AND  
SPECIAL REELS



BRACKETS



SHIMS



SPECIAL  
WASHERS



SPECIAL CLAMPS



# NEW K165...

## It's different than any other KENNAMETAL\* CUTTING GRADE

TYPICAL PERFORMANCE OF KENNAMETAL K165

Work Material	Operation	Tool	Depth of Cut	Speed sfm	Feed ipr	Performance
Arma Steel 88M, 32 RC	Finish facing 50 rms max. finish	KSBL-16C SPG-422	.021"	775	.0024	77 pieces per index with 20-30 rms finish. Best performance other tool material: 20 pieces per index with 40-60 rms finish.
AISI 308 Stainless Steel Tubing	Finish turn tracer lathe	KTGR-20C with TPG-433	.020" to .093"	950	.010	Negligible tool wear, 50 rms finish, .0001" loss of size in 41" cut. Old tool material: .030" flank wear, unacceptable finish, and .005" loss of size.
Cast Iron	Finish turning	Special TNG-321	.020"	1260	.009	Best performance of any other cutting materials evaluated.
M2 HSS Forging	Finish turning	KSFR-16 SNG-422	.100"	585	.016	11 pieces produced with less than .005" wear land. Previous tool material: 6 pieces at considerably lower machining conditions.
304 Stainless Steel	Precision boring	Precision boring tools	.0075"	1500	.003	6 holes, 5" deep, resulted in only .0002" loss of size and a surface finish of 10 rms.
Tricent Cylinder Case, 44.3" dia. x 23" long, 46 RC	Finish turn	KTDR-16C TPG-322	.005"	480	.007	40-60 rms finish. No measurable taper or tool wear. Previous tool material: extreme difficulty in obtaining 125 rms finish; unacceptable taper required additional passes and severe steps.

### Engineered for the new era in machining

- For high velocity precision machining.
- Exceptional high hardness-strength for machining high temperature alloys of low machinability.
- Possesses greater combined crater and edge-wear resistance than conventional tungsten carbide cutting tool materials.
- Produces surface finishes as low as 12 rms and better . . . frequently eliminates expensive grinding operations.
- Maintains greater accuracy . . . reduces "loss of size" due to greater resistance to edge wear.

now available in  
limited number of  
**KENDEX® INSERTS**

**KENNAMETAL Inc.**

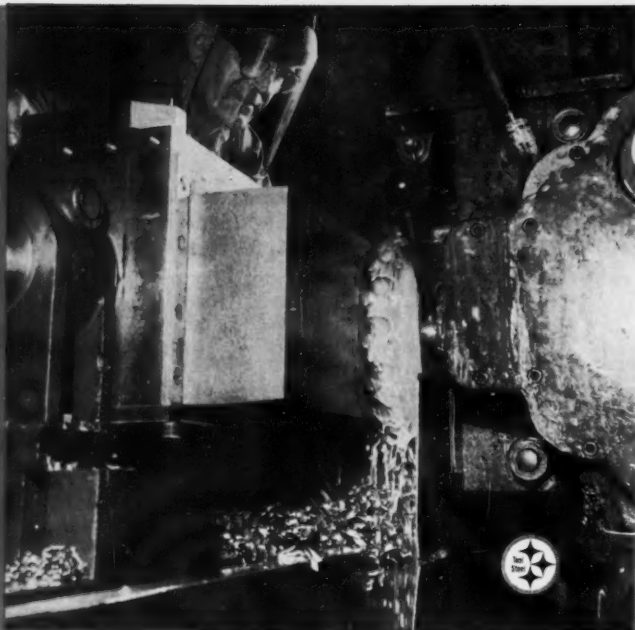
LATROBE, PENNSYLVANIA

\*Trademark

07187

For more data circle 369 on Postpaid Card

**Machining  
Time—  
Cut up  
to 15%**



## **Dependable DESEGATIZED® FM Die Steels**

**. . . easier to work . . . easier to machine**

In the production of thousands of metalworking dies, the properly dispersed alloy sulphides in Latrobe's FM High Alloy Die Steels have permitted increased feeds and speeds—*machining time cut up to 15% in most cases!* This cost-saving production is possible with no sacrifice of the excellent toughness, wear resistance and hardenability properties of the steel.

FM die steels are produced by Latrobe's Desegatized process of manufacture. This process guarantees full structural uniformity of the steel—an even distribution of the all-important carbide particles and "free-machining" alloy sulphides—your assurance of dependable quality.

Four grades of 12% chromium FM steels are regularly stocked: Olympic FM (type D-2) for long-run applications; BR-4 FM (type D-7) for extreme abrasion resistance; GSN FM (type D-3) for severe non-deforming requirements; Cobalt Chrome FM (type D-5) for extra resistance to galling and pickup.

For better die steels and technical service, call your nearest Latrobe representative. Literature on grades available upon request.

*Skillfully  
made in  
U.S.A.  
by ...*

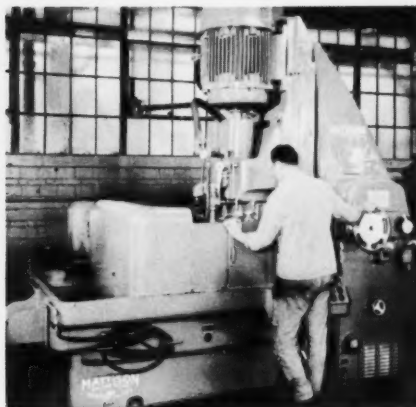


### **LATROBE STEEL COMPANY** **LATROBE, PENNSYLVANIA**

**BRANCH OFFICES and STEEL SERVICE CENTERS:** BOSTON • BUFFALO • CHICAGO  
CLEVELAND • DAYTON • DETROIT • HARTFORD • LOS ANGELES • MIAMI • MILWAUKEE  
NEW YORK • PHILADELPHIA • PITTSBURGH • SAN LEANDRO • TOLEDO

**For more data circle 370 on Postpaid Card**

# Grinding through hard scale at 7½ cubic inches per minute eliminates hidden costs



If you have flat surfaces to machine, there may be an idea here for you in the way Clearing Division of U. S. Industries, Inc., avoids unnecessary costs by grinding.

The flat shape of these 1015 hot-rolled press parts made them difficult to clamp on a milling machine, but the real problem was tough outer scale and burned edges. Cost of cutter replacement was high. Downtime and hidden costs for sharpening were the real reasons Clearing engineers switched from milling to high-powered surface grinding.

A 60-hp spindle motor was specified to increase grain penetration and chip size. High downfeed and coarse, open-structure wheels produced the desired "self-sharpening" action.

With quick-change segments and self-dressing action, downtime was virtually eliminated. The machine cuts through outer scale "like butter"—at the rate of 7½ cu. in. per min.

## New, Quick-Tilt Spindle

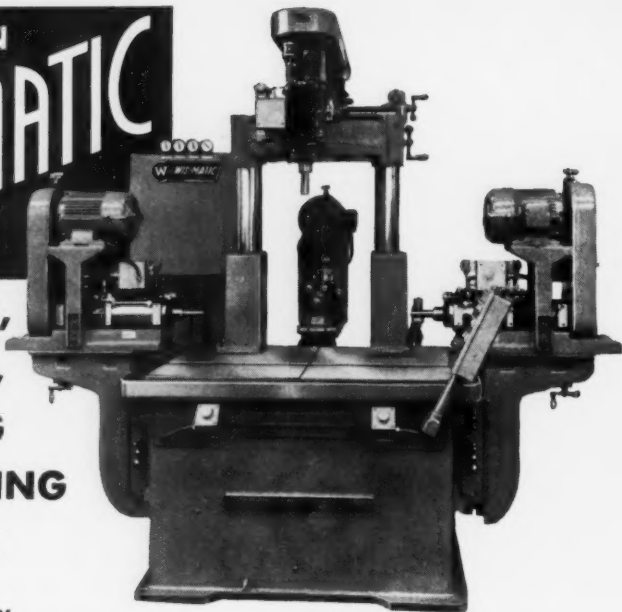
A new power-tilting device for Mattison No. 24 and 36 vertical-spindle rotaries permits you to combine the advantages of stock removal and precision grinding. A flick of the switch changes the spindle from tilted to perpendicular in seconds. With the help of this new feature, we are producing perfect diamond finishes and increasing production by as much as 50% on parts having large, uninterrupted surfaces.

**MATTISON MACHINE WORKS**  
Rockford, Illinois Phone Woodland 2-5521

For more data circle 371 on Postpaid Card

WISCONSIN  
**WISMATIC**

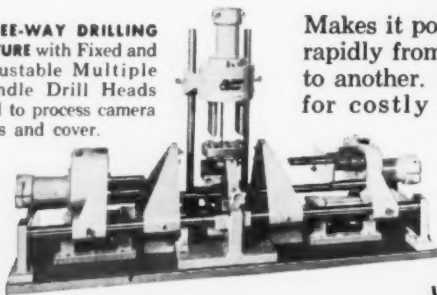
**DRILLING,  
TAPPING,  
REAMING  
and BORING  
MACHINE**



Available in any  
combination of One, Two, Three  
or Four Horizontal and  
One Vertical Power Unit

**WITH PACKAGE TOOLING**

**THREE-WAY DRILLING  
FIXTURE** with Fixed and  
Adjustable Multiple  
Spindle Drill Heads  
used to process camera  
cases and cover.



Makes it possible to change over  
rapidly from processing one part  
to another. Eliminates the need  
for costly special machines.

Makes it readily  
adaptable to a wide  
variety of produc-  
tion jobs.

*Write for Bulletin 560*



**WISCONSIN DRILL HEAD CO.**

4983 NORTH 124TH STREET • BUTLER, WISCONSIN  
For more data circle 372 on Postpaid Card





**SPEEDICUT**

## **ONE HOLE FREE IN EVERY THREE**

Because the new SPEEDICUT "CHIPBREAKER" operates at 50% to 400% higher feed rates, it drills at least three holes in the same time ordinarily required for only two with even the finest general purpose or heavy duty drill. And more holes per regrind means less down time and further savings in production costs.

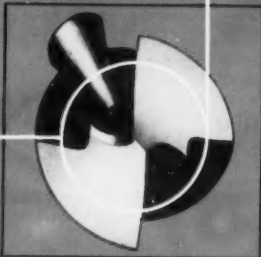
See a demonstration in your own plant on your own equipment and type of work. Your local authorized SPEEDICUT "CHIPBREAKER" distributor will gladly arrange it. Write for literature and name of distributor.

For more data circle  
373 on Postpaid Card

### **THE PATENTED RIB**

that cannot be duplicated

**SPECIFY  
SPEEDICUT "CHIPBREAKER"  
SPEED WITH SAFETY**



**SPEEDICUT DIVISION, CHICAGO HEIGHTS STEEL CO. • CHICAGO HEIGHTS, ILL.**

# Free!

Sample  
Tube of

## MOLYKOTE® G LUBRICANT



### Industry's NEWEST Production TOOL

- ALMOST 100% SAFETY AGAINST GALLING AND SEIZING WITH ALL BEARING METAL COMBINATIONS
- REDUCES WEAR-IN TIME AND DAMAGE IN NEW OR REBUILT MACHINERY
- ELIMINATES STICK-SLIP, METAL PICK-UP AND DISTORTION IN PRESS FITTING
- THE HIGHER THE LOADS, THE GREATER THE MARGIN OF SUPERIORITY OF MOLYKOTE G

Write for your free sample of MOLYKOTE G LUBRICANTS today. We will also send you a copy of our new Bulletin 126 which gives complete details.

#### THE ALPHA-MOLYKOTE CORPORATION

65 Harvard Avenue • Stamford, Conn. • "Research City"  
Plants in  
Stamford, Conn. • Strasbourg, France • Munich, Germany

THE ALPHA-MOLYKOTE CORP.  
65 Harvard Ave., Stamford, Conn.  
*Please send me a free sample of your  
MOLYKOTE G Lubricant.*

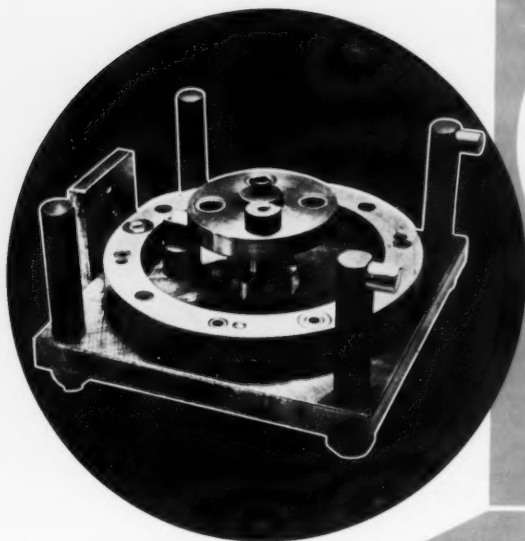
NAME.....  
TITLE.....  
COMPANY.....  
ADDRESS.....  
CITY..... ZONE..... STATE.....



## MOLYKOTE® G LUBRICANT

For more data circle 374 on Postpaid Card

## THIS DRILL JIG NOW MADE IN



**LO-AIR**  
Low Temperature — Air Hardening\*

### TOOL and DIE STEEL

#### Reduces Grinding and Machining Time

LO-AIR, the tool and die steel that features easy machinability and least distortion in hardening, permitted up-grading of steel in this case—as reported by Mr. Joseph Carrera, Plant Superintendent of Quality Tool and Die Company, Hoboken, N.J.—because savings in time more than made up for the difference in material cost.

The drill jig illustrated above required much less heat treating expense—and 25 hours less jig boring and jig grinding time with LO-AIR. It was formerly made of cold rolled machinery

steel, which had to be carburized to provide necessary wear resistance. Also, there was a great hazard of cracking in quenching this part. LO-AIR also solved these problems.

For complete data on this and other LO-AIR applications, write for Performance Report No. 23. Also, we will gladly send you a copy of our 12-page LO-AIR brochure which contains full information on this time and money saving tool and die steel. Complete stocks available. Call our nearest warehouse or sales office for quick delivery.

\*U.S. Pat. No. 2,355,224

**UNIVERSAL  
CYCLOPS**  
STEEL CORPORATION  
EXECUTIVE OFFICES: BRIDGEVILLE, PA.



TOOL STEELS • STAINLESS STEELS • HIGH TEMPERATURE METALS

For more data circle 375 on Postpaid Card

May, 1960

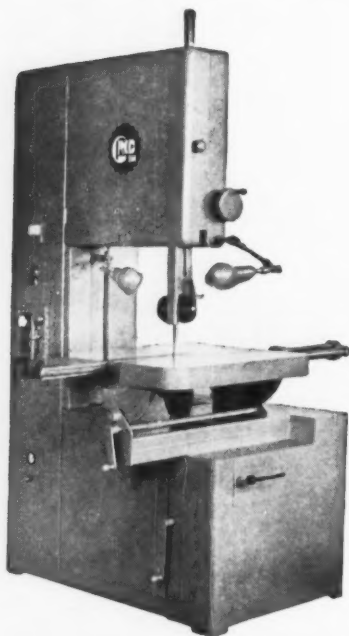
MODERN MACHINE SHOP 73

# GROB

## SPELLS THE DIFFERENCE IN BAND SAW MACHINES

The new GROB 24" universal band saw  
has all the famous GROB features:

Quality • Efficiency • Durability • Strength  
Utility • Low Maintenance • Reasonable Cost



- Speeds infinite from 35-12000 FPM covers both cold and hot sawing

- Variable drive 3-speed transmission with precision rolled gears and splines transmits 15 HP

- Hydraulic table feed

See the difference demonstrated in our dealers' showrooms

or

Write GROB INC. for complete specifications

# GROB

also manufactures a complete line of:



**BUTT WELDERS  
FILING MACHINES  
GEAR ROLLING MACHINES**

**GRAFTON, WISCONSIN**

For more data circle 376 on Postpaid Card



## Co-form X-PRESS TAPS

Manufactured under license from Bealy-Welles Corporation

for tapping threads without cutting



NOW — from HY-PRO you can get the newest in tap design — **Co-form X-PRESS** fluteless taps that are setting cost-reduction records on many jobs that were formerly "tap-killers".

HY-PRO **Co-form X-PRESS** taps cold-form threads in through or blind holes, with these advantages . . .

**No Chips** to clog and cause tap breakage — no chip removal problems • **Permit Faster Tapping Speed** and boost production from automatic equipment • **Provide Accurate Control** of hole size — cannot be forced into lead error • **Eliminate Blind Hole Tapping Problems** — no chips to jam at bottom • **Form Stronger Threads** with better holding power • **Taps Are Stronger** without flutes, especially in smaller sizes • **Taps Last Longer** and maintain accurate size tolerance • **More Holes Per Tap** — up to 40 times greater tap life.

Tap for less with **Co-form X-PRESS**®

® **Co-form** is a registered trademark of Bealy-Welles Corporation.

® **X-PRESS** is a registered trademark of Hy-Pro Tool Company.

### Recommended for tapping . . .

Copper Brass Lead  
Aluminum Zinc  
Steel Magnesium  
Die Castings  
Lead Steel  
Stainless Steel  
— other ductile metals

### Tapping operation is the same

Conventional methods and equipment are used, except for change to larger tap drill sizes.



### STANDARD TAPS



### FROM STOCK

for "most holes per tap" — in any material



Hand and Machine Screw

Spiral Point

Fluteless  
Spiral Point

Spiral Flute

HSS  
Ground  
Thread

Special  
Application

Polley

Acme

Taper Pipe  
Spiral Flute

Straight Flute

Hy-pro Tap Engineering Specialists will help you find out quickly how much you score on "cost per tapped hole." Their job analysis regularly leads to savings of 50% or more — often with a simple switch

to the right style of standard taps. Write for complete information. Find out how much you can save.

For standard taps from stock, call your local Hy-pro Tap Distributor.

## HY-PRO TOOL COMPANY

NEW BEDFORD, MASS., U. S. A.

For more data circle 377 on Postpaid Card

**"why not  
.000040  
tolerance!"\***



Whatever the manufacturing job . . .

- valve and sleeve assemblies
  - carbon assemblies • housing assemblies
  - seals • nut assemblies—to list a few
- ... Acme's jobbing division does it best.

**\***Of course, it's tough to toe such a fine tolerance line! But Acme Industrial has produced scores of parts, big and small, that meet just

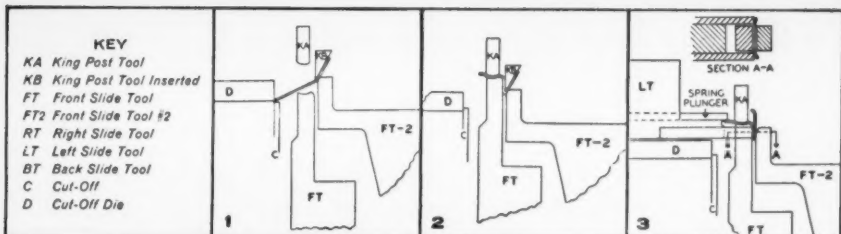
such exacting requirements . . . and we're talking about high volume output! America's missiles, dependent on thousandths-of-an-inch accuracy, incorporate many Acme-made parts. To lay it on the line, very, very few production lines have the number and variety of machines . . . the more-than-a-decade experience . . . the proved reputation for Nth degree production ability. These unique Acme capabilities can work for you.

**ACME INDUSTRIAL COMPANY**  
200 NORTH LAFLIN, CHICAGO 7, ILLINOIS

**SEND!** your new-off-the-presses **FREE** facilities book to me. I'd like to see what your equipment is, what you've done, how it can help our operation.

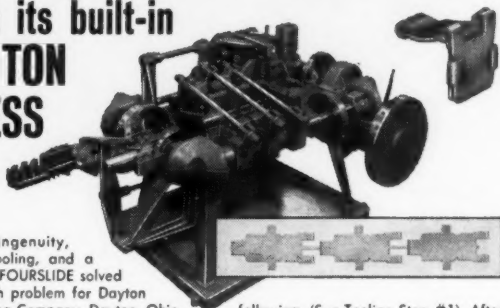
Name \_\_\_\_\_  
Firm \_\_\_\_\_  
Address \_\_\_\_\_  
City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

For more data circle 378 on Postpaid Card



# JOB SHOP MAKES COMPLEX PIECE IN ONE OPERATION

## on a NILSON S-3-F FOURSLIDE with its built-in 20 TON PRESS



Design, ingenuity, simple tooling, and a NILSON FOURSLIDE solved this tough problem for Dayton Coil Spring Company, Dayton, Ohio. They put this job on a NILSON S-3-F for speed and economy of tooling, instead of in their stamping department.

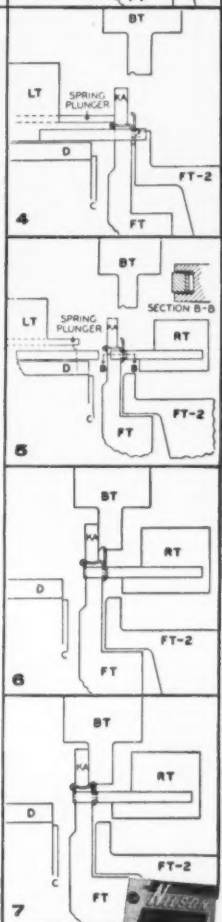
They benefited first by getting into production faster than possible with complicated cams and progressive dies necessary to do the same job. Second, even though the part is complex, the FOURSLIDE tooling is simple and comparatively inexpensive. Third, the entire piece is formed completely in one machine, resulting in equipment and manpower savings.

The built-in 20 Ton Press produces blanks, from .025" x 1.125" cold rolled ribbon steel, which are continuously fed into the FOURSLIDE tooling area, where the first blank is cut off from the one

following. (See Tooling Step #1). After the 6 additional steps shown here the piece is completed and ejected. SEVEN MODELS of NILSON ribbon metal forming FOURSLIDES are available with various speed ranges between 32 to 204 parts per minute, stock widths up to 3 1/2 inches, and with built-in press sections ranging from 5 to 75 tons capacity.

Many of these production savings can be yours when you consider every metal stamping and wire forming job as an opportunity to save time and dollars with a NILSON FOURSLIDE MACHINE.

Remember—it's usually simpler to tool a FOURSLIDE, it's certainly faster, the economy is startling, and you'll do stamping jobs in one operation that you didn't think could be done.



**NILSON**  
A. H. NILSON MACHINE CO.  
627 Bridgeport Avenue • Shelton, Conn.

Write today for the NILSON  
FOURSLIDE Catalog No. 62.



For more data circle 379 on Postpaid Card





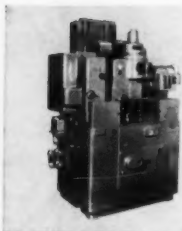
**for Every Gear Production Job . . .**

Right from the blank to the finished external or internal spur or helical gear, Fellows has the complete line of gear production and inspection equipment to meet all your requirements!

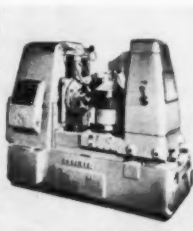
No other builder in the world offers as long and varied a line: Fellows Gear Shapers; Pfauter Gear Hobbers; Fellows-Reishauer Gear Grinding Machines; Fellows Gear Inspection Instruments; Fellows special machines and attachments; Fellows Gear Shaper Cutters. All this, *plus* the benefit of our sixty years of specialized experience in solving gear production problems.

Ask your Fellows representative for information on the complete line of Fellows gear production and inspection equipment. If you have a problem requiring special equipment, ask him to help you solve it, or write direct.

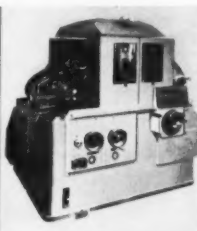
## .... Fellows Has the Equipment to Shape, Hob, Grind and Inspect



Fellows Gear Shapers cut internal and external spurs and helicals; capacities to 120" P.D.



Pfauter Gear Hobbing Machines for spur and helical gears; capacities to 120" P.D.



No. 12 Fellows-Reishauer Gear Grinding Machines grind spurs and helicals to 12" O.D.



No. 20M Fellows Red Liners make and record the "composite check" of spur and helical gears to 18" P.D.

THE FELLOWS GEAR SHAPER COMPANY  
78 River Street, Springfield, Vermont

Branch Offices:

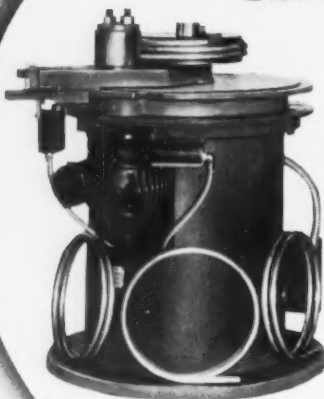
1048 North Woodward Ave., Royal Oak, Mich.  
150 West Pleasant Ave., Maywood, N. J.  
5835 West North Avenue, Chicago 39  
6214 West Manchester Ave., Los Angeles 45

THE  
PRECISION  
LINE

*Fellows* Gear Production Equipment

For more data circle 380 on Postpaid Card

# BENDING CIRCLES ?



Pedrick Production Benders travel in the best circles—and produce from pipe, tubing or structural metal the best circles or any other type of bend—faster, more economically.

**PEDRICK TOOL AND MACHINE CO.**

3640 N. Lawrence St.  
Phila. 40, Pa., Dept. 5

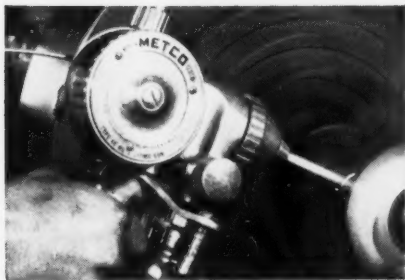
“Select your proper bending machine from the  
NEW PEDRICK LINE BULLETIN. Ask for it now.”



# BEND WITH PEDRICK

For more data circle 381 on Postpaid Card

# Complete your shop with this modern metallizing installation



**WIRE GUN**—Sprays any metal that can be drawn into wire form.



**POWDER GUN**—Sprays hard-facing alloys and ceramics in powder form.

Without metallizing, no maintenance or "job" shop can offer the same complete service as the shop that uses industry's low-cost "putting-on" tool.

With modern, low-cost metallizing equipment you can spray carbon steels, stainless, babbitts, brass, bronze, nickel, aluminum, tin, zinc, special hard-facing alloys, including tungsten carbide.

■ Save up to 90% of replacement costs on machine repair jobs ■ Do your own hard-facing at high speed, low cost ■ Apply long-wearing, corrosion-resistant coatings

**A real opportunity for the smaller shop.** Thousands of large, well-known companies and shops have been metallizing users for many years, not only in maintenance work but in production applications on original equipment. Now, with modern low-cost metallizing equipment this high-speed "putting-on" tool is within the reach of even the smallest shop.

## FREE BULLETIN



Send off the coupon for detailed information—find out how a metallizing installation can pay for itself in a very short time. No obligation, of course.

## Metallizing Engineering Co., Inc.

Flame Spray Equipment and Supplies



### METALLIZING ENGINEERING CO. INC.

1177 Prospect Ave., Westbury, L. I., New York

Please send me free bulletin on metallizing.

Name \_\_\_\_\_

Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_

Zone \_\_\_\_\_

State \_\_\_\_\_

For more data circle 382 on Postpaid Card



More than...

3/4

of a century  
improving  
metal cutting  
techniques

makes it possible  
to select without "guess-work"  
the proper cutting tools for your production.

In STANDARD'S modern research laboratory,  
metallurgical experience and engineering design skills,  
combine, in developing better ways of machining  
today's tough alloys and materials.

These practical cost saving recommendations as to

selection of the correct  
cutting tool, grinds and  
speeds, are yours for the  
asking . . .

Just call the  
STANDARD Authorized  
Distributor in your area.  
Special metal cutting  
problems will receive  
prompt attention.



STANDARD TOOL Co.

3950 CHESTER AVENUE

CLEVELAND 14, OHIO

BRANCH WAREHOUSES IN: NEW YORK · DETROIT · CHICAGO · DALLAS · LOS ANGELES · SAN FRANCISCO



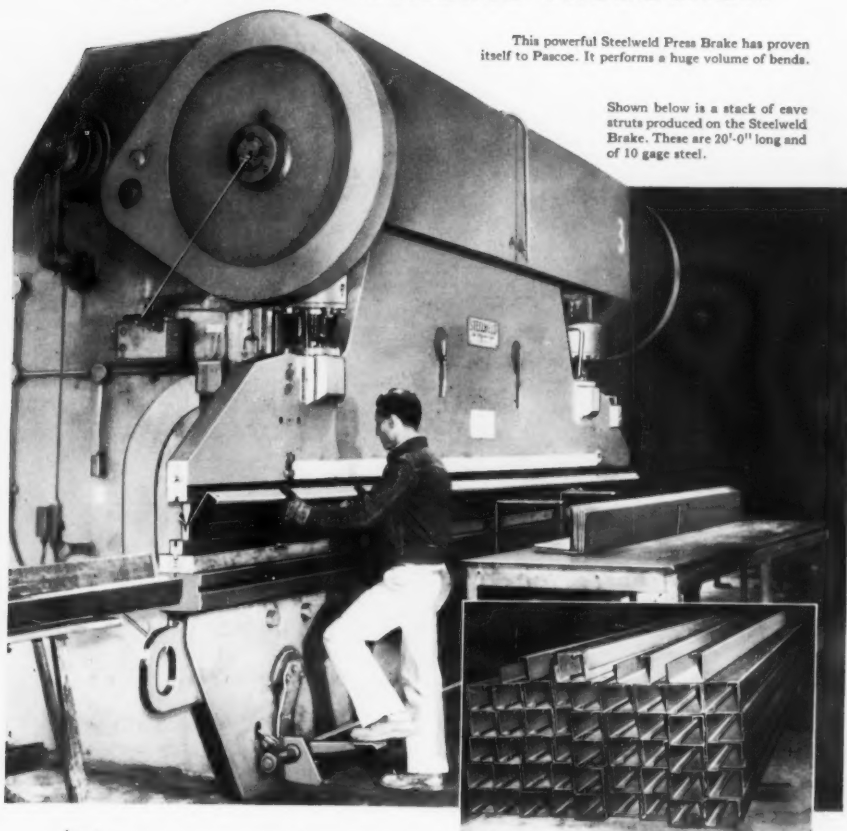
For more data circle 383 on Postpaid Card

# STEELWELD BRAKE

## AIDS PASCOE BUILDING PRODUCTION

This powerful Steelweld Press Brake has proven itself to Pascoe. It performs a huge volume of bends.

Shown below is a stack of eave struts produced on the Steelweld Brake. These are 20'-0" long and of 10 gage steel.



**A**N important manufacturer of prefabricated steel buildings on the West Coast, the Pascoe Steel Corporation, Pomona, California, keeps their Steelweld Press Brake going full tilt in order to keep up with the production schedule.

The brake normally handles steel up to 20'-0" x  $\frac{3}{16}$ ", although occasionally  $\frac{1}{4}$ " metal is formed. It has the speed and power to produce sharp accurate bends at a fast rate.

Despite all the work put through, only the meagerest amount of maintenance is required. For instance, the clutch has had to be adjusted only once, every eight-month period and this

can be done in very few minutes.

Pascoe builds a complete line of pre-engineered buildings which are used for warehouses, light manufacturing, grain storage, auditoriums, aircraft hangers, etc.

Write for free copy of catalog No. 2023A

**STEELWELD**  
Mechanical and Hydraulic  
**PRESS BRAKES**

Steelweld Machinery includes: Mechanical & Hydraulic Shears and Press Brakes, One-, Two- and Four-Point Straight-Side Presses, Speed-Draw Presses.

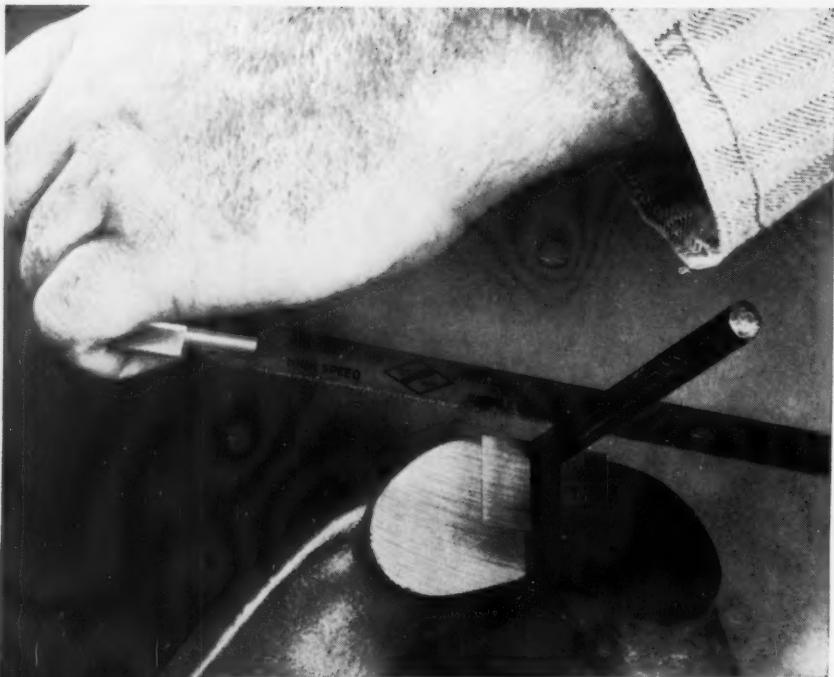


THE CLEVELAND CRANE & ENGINEERING COMPANY • 6473 EAST 281st STREET • WICKLIFFE, OHIO

For more data circle 384 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 83



## **BARNES HIGH SPEED HAND BLADES** *cut fast and clean!*

### **ROCKET**

HIGH SPEED

#### **Flexible**

A high quality blade for general shop use where safety is important.

### **SERVICE**

HIGH SPEED

#### **All-Hard Molybdenum**

An ideal blade for machine shop use. Preferred by the experienced tool maker.

### **RED ARROW**

HIGH SPEED

#### **All-Hard Tungsten**

Unequalled for use in the tool room to cut die steels and abrasive materials.

Modernly packaged and color-coded for easy identification, Barnes blades are positively protected to reach you factory-new and ready-for-work.

Call your local Barnes distributor today! He will help you select the Barnes hand blade that will give you maximum blade life and reduce your cutting costs. His ample stock and prompt service will simplify your storage and handling problems.

**W. O. BARNES CO., INC.**

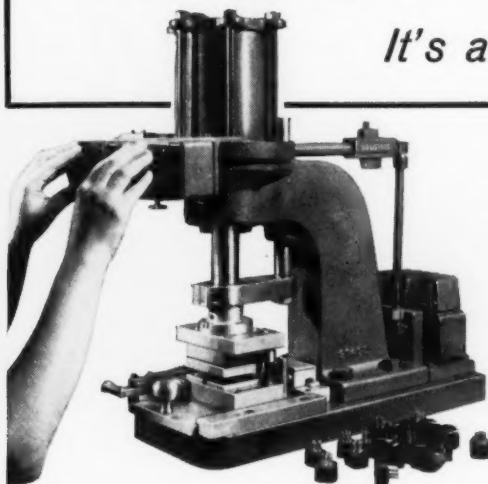
1297 TERMINAL AVENUE • DETROIT 14, MICHIGAN

For more data circle 385 on Postpaid Card



Solve your "Small Parts" production problems  
with a **HANNIFIN "HAN-D-PRESS"**

*It's air operated!*



The husky Hannifin "Han-D-Press" takes operator fatigue out of light production operations where speed is the key to economy. A safe, easy-to-operate Hannifin air-operated bench press can handle these sometimes troublesome jobs better, faster and easier.

**RIVETING  
STAKING  
PUNCHING  
PRESSING  
ASSEMBLING  
MARKING**

**CHECK THESE FEATURES:**

- Electric control through Hannifin 4-way solenoid-actuated valve.
- Guided ram. Speed easily adjustable. Automatic return.
- Removable steel base plate. Easy to change job set-ups using alternate work bases.
- Minimum maintenance. Rigid frame; cylinder "true-bored" and honed.
- Half-ton and one-ton models. Low prices. Immediate delivery.


*Call Your Hannifin Man for Complete Information*

**HANNIFIN COMPANY**

565 South Wolf Road • Des Plaines, Illinois

— A DIVISION OF PARKER-HANNIFIN CORPORATION —

For more data circle 386 on Postpaid Card



**Throw those  
old fashioned collets away!**

*Atlas* **SHELDON DELTA SOUTH BEND** *Logan*

lathes with the world's most modern  
collet chuck and its Rubber-Flex® Collets

**\$70<sup>00</sup>**

Model 50  
Collet Chuck

**\$65<sup>00</sup>**

Complete Set of  
10 Rubber-Flex Collets

# You get a lot more for less!

model

# 50

- is a brand new nose type handwheel chuck
- is quicker to operate
- is easier to operate
- is more accurate
- develops more torque
- increases lathe capacity
- mounts directly onto your spindle
- costs less . . . less . . . less . . .

## A lot more for a lot less...

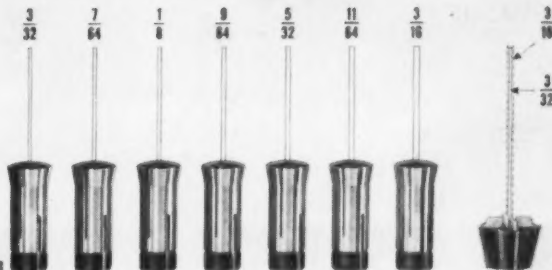
# \$70<sup>00</sup>

for the chuck!

# \$65<sup>00</sup>

for the collets!

(\$6.50 each)



An entirely new series of ten Jacobs Rubber-Flex Collets has been developed along with the world's most modern collet chuck. Rubber-Flex collets do more because:

- Jaws are always parallel for greater accuracy . . . maximum runout .001".
- Long bearing surfaces have stronger grip.
- Only 10 collets chuck all bar sizes— $\frac{3}{16}$ " to  $1\frac{1}{16}$ "—.100" range per collet.

### How one Rubber-Flex collet replaces seven split steel collets

This is the chuck,  
these are the collets,  
for your . . .

ATLAS • DELTA • LOGAN  
SHELDON • SOUTH BEND  
. . . lathes

See your Jacobs industrial supply distributor. Let him prove these fantastic facts with a convincing demonstration at your desk! Call him today.



# Jacobs

## CHUCKS

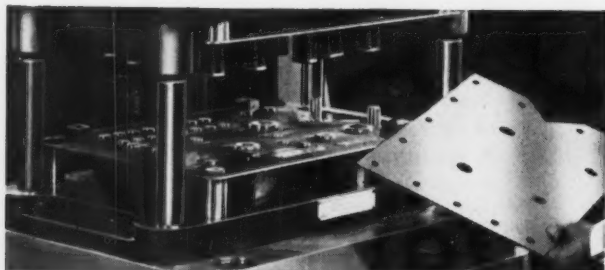
JACOBS MANUFACTURING COMPANY • WEST HARTFORD, CONNECTICUT

For more data circle 387 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 87

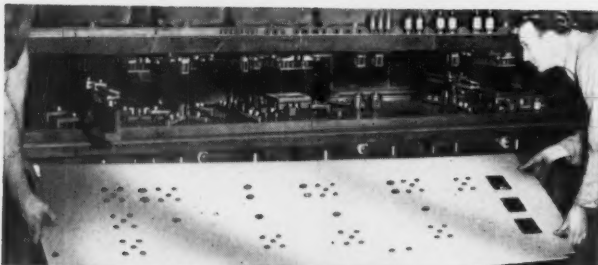
# OVER 2700 PLANTS are saving money with WHISTLER DIES



## MAGNETIC PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia.

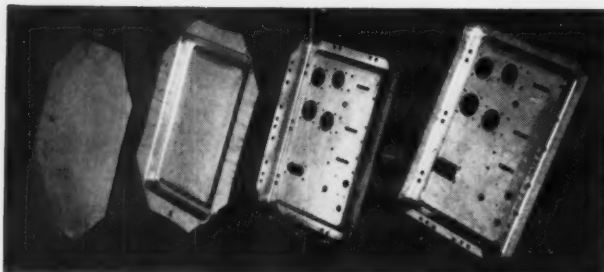
Larger sizes available.



## ADJUSTABLE PERFORATING DIES

All parts reusable and interchangeable. Punches and dies stocked in .001" increments from .100" thru .500" dia.

Larger sizes available.



manufacturer  
of all types of  
**CUSTOM DIES**  
for over 40 years

**WRITE FOR  
COMPLETE DETAILS**

**S. B. WHISTLER & SONS, INC., 740 Military Rd., Buffalo 23, N. Y.**

Mail the following: ☐ Magna-Die Catalog ☐ Adjustable Die Catalog  
☐ More information on custom die work

NAME \_\_\_\_\_ TITLE \_\_\_\_\_

COMPANY \_\_\_\_\_

STREET \_\_\_\_\_

CITY \_\_\_\_\_ ZONE \_\_\_\_\_ STATE \_\_\_\_\_



For more data circle 388 on Postpaid Card

Another addition to the famous "Greenfield" Line...

# Greenfield

**Tru-  
Lede**

## Fluteless Taps

Patent No. RE. 24572

**FOR  
PRESSURE FORMING  
INTERNAL THREADS  
IN  
COPPER  
BRASS  
ALUMINUM  
DIE CASTINGS  
LEADED STEELS  
and other ductile materials**



TRU-LEDE fluteless taps do not cut threads in the same manner as conventional taps. Actually they are a forming tool and their action may be compared with external thread rolling. No problem of chip disposal as there are no chips with this method. Under proper conditions and in the appropriate materials, they are giving outstanding results in hundreds of applications.

Ask your GREENFIELD Distributor for a copy of this 4-page pamphlet. It contains the complete story: Sizes available, recommended limits, selecting the right tap drill, and other information you'll want to have.



A Greenfield field engineer is available to talk over your tapping requirements and to discuss how TRU-LEDE TAPS can help you. CALL HIM THROUGH YOUR GREENFIELD DISTRIBUTOR.

**GREENFIELD TAP & DIE**

**GREENFIELD, MASSACHUSETTS**  
For more data circle 389 on Postpaid Card

# COST CONSCIOUS?

*new*

## **FULMER** Honing Machines **COST LESS**

... To Purchase

... Install ... Operate

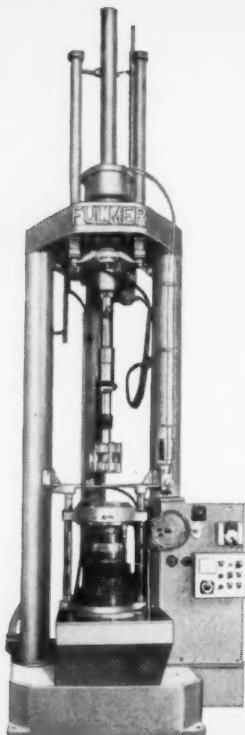
... Maintain ... Modify

Fulmer Honing Machines are better designed for accurate performance ... better constructed for years of economical operation ... None more flexible or easily modified. Automatic feeding, sizing, stone wear compensation, and other features available.

*Cost conscious customers—  
call FULMER*

**C. ALLEN FULMER CO.**

Dept. 30-A • 107 E. Fourth St.  
Cincinnati 2, Ohio • MA 1-4683



**FULMER**

**WORLD'S BEST**

**Honing Machines**

For more data circle 390 on Postpaid Card

**INCREASES  
PRODUCTION...**

**LOWERS COSTS...**

**PAYS FOR ITSELF  
QUICKLY...**

The ROUSE HAND MILLER is a widely used, inexpensive, high speed, ball bearing, motor driven machine for handling light cuts in brass, aluminum, steel, plastics, and other materials—fast, accurately, and at very low cost. Only \$116.00\*

Fixtures (illustrated) extra.

Motor equipment:— $\frac{1}{4}$  H.P. 110 Volt AC 60 cycle, single phase, swivel motor mount and light—\$45.00\*

\*All prices FOB Chicago.



- ★ **MILLS SMALL PARTS MUCH FASTER.**
- ★ **DRASTICALLY CUTS YOUR INVESTMENT IN EQUIPMENT.** Replaces expensive production machinery—or releases it for other jobs.
- ★ **INEXPERIENCED HELP CAN OPERATE IT.** Safe, simple, fool-proof operation.
- ★ **NO MORE COSTLY SET-UP TIME. \$116.00\*** price so low that it pays to keep one or more Hand Millers always set-up for special operations.
- ★ **YOU GET A BETTER PRODUCT**—the result of ABSOLUTE ACCURACY.
- ★ **A LOSS BECOMES A PROFIT** when marginal pieces are finished on the Hand Miller instead of on high cost equipment.
- ★ **VERY LOW MAINTENANCE.**
- ★ **USED REGULARLY IN 1163 MANUFACTURING PLANTS** (some of which use as many as 30 machines)—yet on the market a scant few years.
- ★ **UNIQUE—VERSATILE.** Nothing else like it. One or several machines can be the answer to some of your production problems.

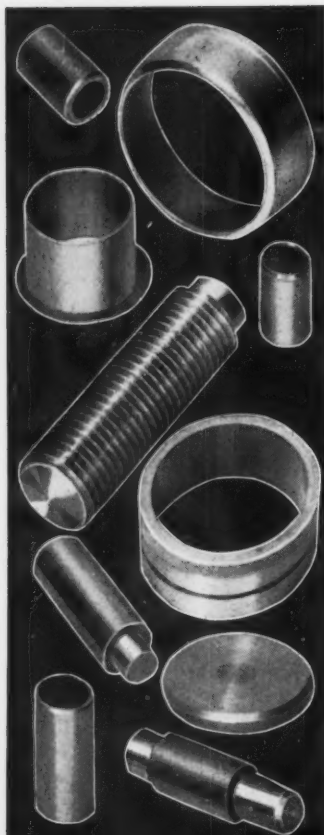
**Write today  
for further  
information.**

**H. B. ROUSE & COMPANY**

2214 N. WAYNE AVE., CHICAGO 14  
50 YEARS OF SERVICE TO INDUSTRY

For more data circle 391 on Postpaid Card





## TO CUT OFF AND FORM TUBING AND BAR STOCK IN A SINGLE OPERATION

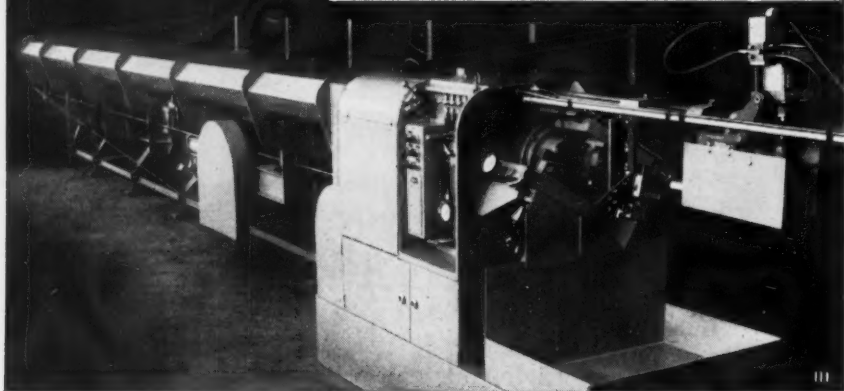
Here is a combination that feeds tubing and bar stock — automatically — to a fast, automatic cutting-off machine. Best of all, the pieces being cut off can be formed, grooved, flanged or chamfered at the same time.

There are models that handle tubing, pipe and bar stock from  $\frac{1}{8}$ " diameter up to solid bar stock of 3" OD and tubing up to 8" OD.

Why not investigate?

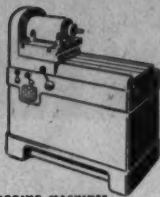
WRITE FOR CATALOG

**MODERN MACHINE TOOL CO.**  
2005 Losey St. • Jackson, Michigan

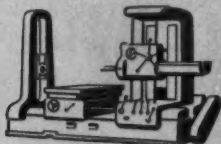


For more data circle 392 on Postpaid Card

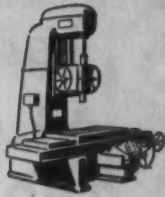
**eliminate "cut and try"  
with Microbore...**



PRECISION BORING MACHINES



HORIZONTAL BORING MACHINES



JIG BORING MACHINES



TURRET LATHES



... THE TOOL THAT ADJUSTS PRECISELY IN SECONDS!

YES, EVERY TIME—ALL THE TIME! In seconds, with our proven micrometer vernier adjustment, any operator who can read a "mike" can adjust a Microbore Tool for precision boring to extremely close tolerances.

Any production man knows what that means. Elimination of wasteful down time. Greater productivity of men and machines. Fewer rejects. Better parts due to holding closer tolerances.

It just makes good sense to *Modernize with Microbore*. A few dollars so invested can increase the productivity of a machine costing thousands.

Microbore units can also be applied in clusters for special tooling designed for high production applications.

*A wide range of Microbore Boring Bars with NMTB taper, Morse taper, Flash-Change and Straight Shanks are available singly or in complete sets. Standard set includes Microbore units for each tool station, grinding blocks and necessary wrenches, in a fitted hardwood case.*



As the first step in eliminating your own costly "cut and try" methods, write for Microbore Catalog No. 56.

**DEVLIEG MICROBORE SYSTEM**

DEVLIEG MICROBORE • DIVISION OF DEVLIEG MACHINE COMPANY

Fair Street • Royal Oak, Michigan

For more data circle 393 on Postpaid Card

*For Quick  
Changing  
Versatility...*

## **ALORIS TOOL POSTS & TOOL HOLDERS**

No other tool does all that the Aloris Tool Post does. No other Tool Holders can be changed so simply and accurately . . . and no other line is so complete!

You can change quickly and easily from one lathe operation to another. What's more, you eliminate entirely the use of shims as each Aloris Tool Holder has its own built-in height adjustment. The life of your tools will be longer and they can be sharpened without removing them from the Tool Holder.

With Aloris Tool Posts and Tool Holders you have quick changing versatility for all lathe operations.

See Aloris in actual operation at the Metal Show in Dallas May 9th through 13th at Booth #519.

**ALORIS**  
**TOOL COMPANY, INC.**

**419 Getty Avenue, Clifton, New Jersey**

For more data circle 394 on Postpaid Card



# NEW, AUTOMATIC RECESSING TOOL

*answers the "chatter problem"*

## WITH RIGID, SINGLE-JOINT DESIGN

### ELIMINATES TOOL DEFLECTION, ASSURES CLOSE TOLERANCES, FINE FINISHES

- 1 Solid, single-bar construction prevents cutters from chattering and keeps tool cutting accurately to depth, width and position. There is *only one joint* to effect tool accuracy... with a long supporting bearing surface.
- 2 End clearance is absolutely eliminated through the use of pre-loaded thrust bearings.
- 3 Uniform feed out is assured through precision-machined, double spiral feed cam and heavy duty feed pin.
- 4 Removeable ball bearing thrust plate will not damage work or bushing.

### PRECISION ADJUSTMENT

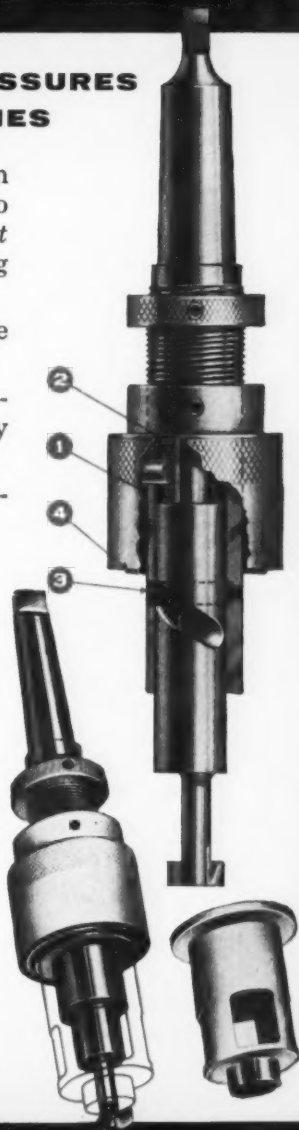
Depth and position of recess is adjusted through two calibrated adjustment nuts. Set up time is negligible. *Use Tool on Any Machine*... on any standard drill presses, milling machines, lathes, automatics, etc.

### NEW, SNAP-ON ADAPTOR CONVERTS TOOL FOR PILOTING IN WORK!

The new Madison tool can pilot through a bushing in the work... or, by adding the adaptor, pilot in the work itself. The adaptor is used on work-turning machines such as lathes. Fixture bushings are normally employed on machines where the spindle is turning, as on drill presses.

*Write for more information.*

For more data circle 395 on Postpaid Card



**MADISON** *industries, inc.*

P. O. BOX 1137, PROVIDENCE, R. I.

## Power your fixtures this easy way



You can cut the time required to open and close fixtures by a third or more with the Bellows HAN-D-AIR cylinder. These small, compact 1-1/8" bore air cylinders develop 80-to-100 lbs. of thrust at average shop air pressures. They are easy to install on many standard fixtures and readily incorporated into special fixtures. They are so low in cost it's easier to leave them permanently on the fixture than to transfer them from one fixture to another.

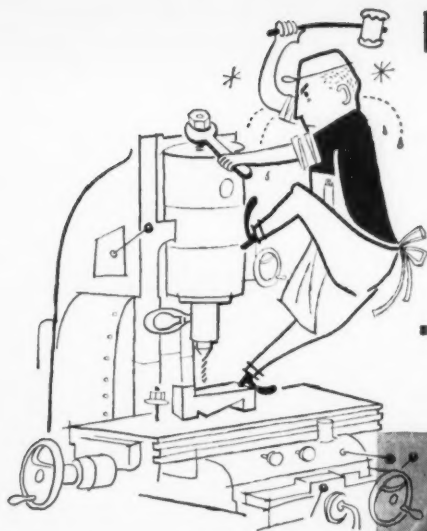
Bellows HAN-D-AIR cylinders are available in 1, 2, 3 and 4" stroke lengths, in both single and double acting types. Can be mounted in any position. The 5/16" dia. piston rod is threaded for easier installation.

895B-3

Write for information and prices on the Han-D-Air Cylinder. Address Dept. MMS560, Bellows-Valvair, Akron 9, Ohio. In Canada: Bellows-Valvair Ltd., Toronto 18, Ontario.

**Bellows-Valvair**  
The Bellows Co. • Valvair Corp. Akron 9, Ohio  
DIVISIONS OF INTERNATIONAL BASIC ECONOMY CORPORATION (IBEC)

For more data circle 396 on Postpaid Card

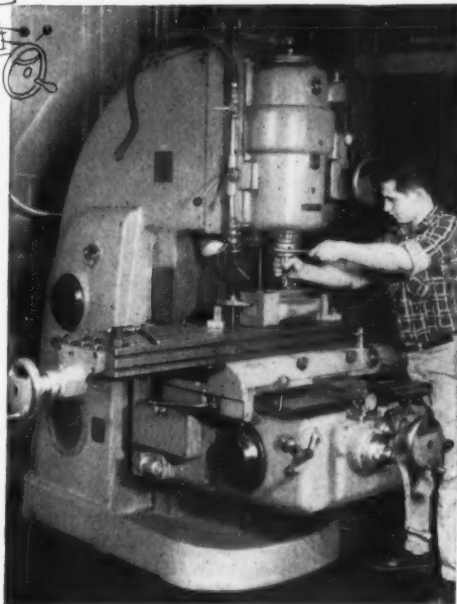


**HOW MODERN  
IS YOUR  
METHOD?**

**...THIS**

**...or *THIS***

The modern P.D.Q. tooling method completely eliminates the time lost in changing old fashioned type tools. No more "sweating out" loosening and tightening the draw bolt. A 60° turn of the lock nut and you're ready for another tool. P.D.Q. tool changes are only a matter of seconds . . . and tools are available in very small, small, medium and large series depending on the application. Write for literature covering all the advantages of modern, cost cutting P.D.Q. (Portage Double Quick) tooling.



REPRESENTATIVES IN PRINCIPAL CITIES

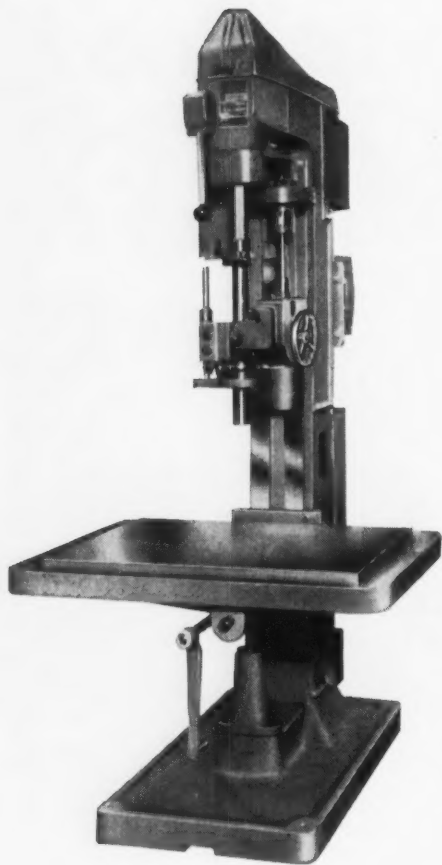
**PORTAGE Double-Quick TOOL CO.**

1041 SWEITZER AVENUE • AKRON 11, OHIO

For more data circle 397 on Postpaid Card



# automatic cycle drilling machine



You can chop your time costs with automatic set-ups on this new Avey machine, and still take advantage of the low cost and flexibility of a standard unit.

Adjustable rapid power traverse, feed, and rapid return of the spindle are the features which permit automatic transfer or rotary index fixturing.

At the same time, you get adjustable feeds, speeds, table travel, head travel, and Avey's advanced spindle construction.

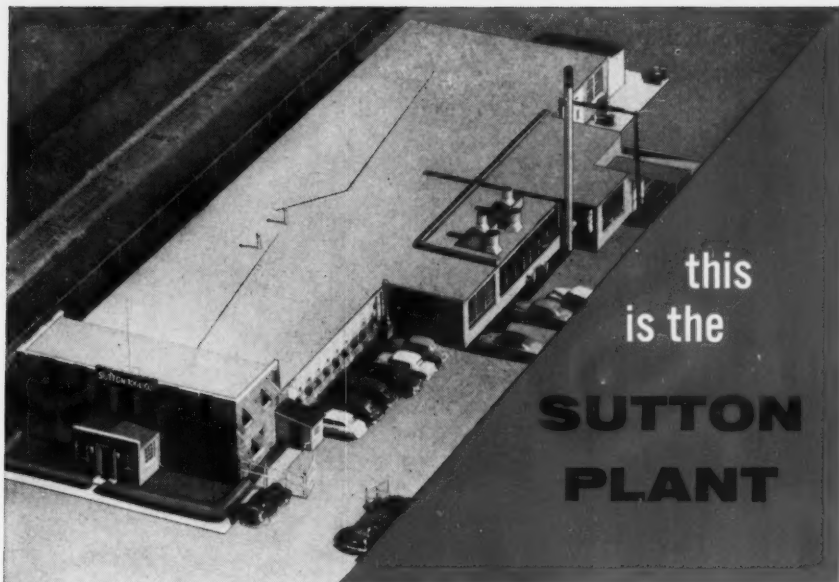
The machine is available with No. 2, 3, and 4 Morse Taper; 1 to 3 HP motors; single or multiple spindles. Your request for additional information will be promptly answered. Avey Division, The Motch & Merryweather Machinery Co., Box 1264 Cincinnati 1, Ohio.

another first by

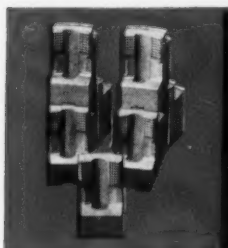


For more data circle 398 on Postpaid Card





**Where SPECIAL TOOLS and ALL KINDS  
OF WORK-HOLDING DEVICES ARE MANUFACTURED!**



*These chuck jaws are one example of the many work-holding devices designed and manufactured or manufactured to customer design by Sutton!*

- Standard and Special Chuck Jaws
- Expanding Mandrels
- Gear Hobbing Arbors
- Special Arbors of All Types
- Special Collets
- Special Collet Chucks (Air and Hydraulically Operated)
- Special Diaphragm Chucks to Customer Designs

- Milling Machine Adapters • Special Adapters for All Machines • Special Boring Bars
- Extension Tap Spindles • Special Machine Spindles • Special Screw Machine Spools and Bushings • Special Tool Blocks and Tool Holders
- Special Cutter Heads • Special Mill and Drill Sleeves • Many Other Unusual Designed Tools

**Check Sutton Ability to Make, Deliver, and Price  
Such Items as These! Write for Tool Bulletin No. 70**

**SUTTON TOOL CO., Dept. MMS-5 Phone 1194, Sturgis, Mich.**

For more data circle 399 on Postpaid Card

# EASTERN AIR LINES, INC.

10 ROCKEFELLER PLAZA  
NEW YORK 20, NEW YORK

UNIFORM AIRBILL		AIRBILL NUMBER (INSERTED BY CARRIER)	
NON-NEGOTIABLE		07- 409205	
FROM (CONSIGNEE) Dialo Bearings, Inc. CONSIGNEE'S STREET ADDRESS 407 Pendleton Street CITY Greenville STATE S. C. CONSIGNEE'S NO.		TO (CONSIGNEE) Dialo Bearings, Inc. CONSIGNEE'S STREET ADDRESS 3034 Euclid CITY Cleveland STATE OHIO CONSIGNEE'S NO.	
DESTINATION AIRPORT (CITY) Cleveland		ZONE 15	



# 2 worn-out spindles received early Sunday...2 rebuilt spindles in service Monday morning, 600 miles away!

The customer was in Greenville, South Carolina working on a time contract with stiff penalties for failing to meet the deadline. The spindles on two of their most important machine tools failed almost simultaneously and there were no spares available.

Our subsidiary, Dixie Bearings, Inc., was called late Saturday; our Spindle Repair Department in Cleveland alerted and, with the cooperation of Eastern Airlines, the spindles

were in our shop early Sunday. By working all day Sunday, the spindles were back in Greenville and in operation on Monday morning!

This is only one of the many bearing services we provide. For fast help in solving any problem involving bearings—for quick delivery of any nationally known make of bearing—call the branch nearest you, day or night!

## BEARINGS, INC.

*Providing bearing service  
in the North*

and

*in the South*

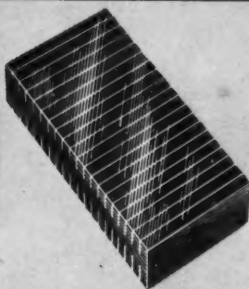
**OHIO:** Akron • Canton • Cincinnati • Cleveland • Columbus • Dayton • Elyria • Hamilton • Lima • Lockland • Mansfield • Painesville • Toledo • Youngstown  
Zanesville • **INDIANA:** Ft. Wayne • Indianapolis • Muncie • Terre Haute • **PENNSYLVANIA:** Erie • Johnstown • Philadelphia • Pittsburgh • York  
**WEST VIRGINIA:** Charleston • Huntington • Parkersburg • Wheeling • **NEW JERSEY:** Camden • Newark  
**NEW YORK:** Balaban Corp., Buffalo • Niagara Falls • **MARYLAND:** Baltimore • **DELAWARE:** Wilmington

## DIXIE BEARINGS, INC.

**FLORIDA:** Jacksonville • **GEORGIA:** Atlanta • **KENTUCKY:** Louisville • **LOUISIANA:** Baton Rouge • New Orleans  
**N. CAROLINA:** Charlotte • Greensboro • **S. CAROLINA:** Greenville • **TENNESSEE:** Chattanooga • Kingsport • Knoxville • Nashville  
**VIRGINIA:** Norfolk • Richmond

For more data circle 400 on Postpaid Card

# MAGNA-LOCK magnetic PARALLELS and V-BLOCKS



**Get precision**

**that insures precision . . .**

Largest selection of standard sizes. No rivets or dowels. Positive welded non-shift laminations.  $\frac{1}{32}$ " non-magnetic steel laminations and  $\frac{1}{8}$ " low-carbon steel laminations. No plastic or soft filler. Shipped in standard cartons, wood boxes at extra cost. Special parallels and V-blocks on request.

**PLACE YOUR ORDER NOW FOR PROMPT SHIPMENT.**

## PARALLELS . . . ground singly or in pairs

Number	Dimensions	Wt. Each	Price Each	Price Pair
M-1	$\frac{1}{4} \times 1\frac{1}{2} \times 3$	1 $\frac{1}{2}$ lbs.	\$11.00	\$20.00
M-2	$\frac{1}{4} \times 1\frac{1}{2} \times 6$	2 $\frac{1}{2}$ lbs.	17.00	30.00
M-11	$\frac{1}{8} \times 2 \times 4$	2 $\frac{1}{2}$ lbs.	17.50	31.00
M-153	1 x $1\frac{1}{2} \times 3$	1 $\frac{1}{2}$ lbs.	13.00	23.00
M-22	1 x 2 x 2	1 $\frac{1}{2}$ lbs.	12.00	21.00
M-23	1 x 2 x 3	2 lbs.	15.00	27.00
M-3	1 x 2 x 4	2 $\frac{3}{4}$ lbs.	18.00	32.00
M-4	1 x 2 x 5	4 lbs.	19.00	34.00
M-28	1 x 2 x 8	5 $\frac{1}{2}$ lbs.	22.00	39.00
M-255	1 x $2\frac{1}{2} \times 5$	3 $\frac{1}{2}$ lbs.	20.00	36.00
M-34	1 x 3 x 4	3 $\frac{1}{2}$ lbs.	20.00	36.00
M-5	1 x 3 x 6	6 lbs.	26.00	46.00
M-38	1 x 3 x 8	7 $\frac{1}{2}$ lbs.	37.00	66.00
M-312	1 x 3 x 12	12 lbs.	52.00	93.00
M-356	1 x $3\frac{1}{2} \times 6$	6 $\frac{3}{4}$ lbs.	32.00	57.00
M-6	1 x 4 x 4	5 $\frac{1}{2}$ lbs.	22.00	39.00
M-46	1 x 4 x 6	8 lbs.	37.00	66.00
M-48	1 x 4 x 8	9 $\frac{1}{2}$ lbs.	45.00	81.00
M-412	1 x 4 x 12	16 lbs.	73.00	131.00
M-510	1 x 5 x 10	18 lbs.	77.00	138.00
M-610	1 x 6 x 10	20 lbs.	79.00	142.00
M-612	1 x 6 x 12	24 lbs.	100.00	180.00
M-7	1 x 8 x 8	22 lbs.	86.00	154.00
M-8	$1\frac{1}{2} \times 1\frac{1}{2} \times 4\frac{1}{2}$	2 $\frac{1}{2}$ lbs.	19.00	34.00
M-9	$1\frac{1}{2} \times 2 \times 3$	1 $\frac{1}{2}$ lbs.	17.00	30.00
M-248	2 x 4 x 8	18 lbs.	86.00	154.00

## V-BLOCKS 90° V and 45° from centerline

Size No.	Height, Inches	Width, Inches	Length, Inches	Price Each	Price Pair
MV-1	1 $\frac{1}{2}$	2 $\frac{1}{2}$	2 $\frac{1}{2}$	\$38.00	\$68.00
MV-2	1 $\frac{1}{2}$	2 $\frac{1}{2}$	4	58.00	102.00
MV-3	2	6	6	96.00	172.00
MV-4	1 $\frac{1}{2}$	2 $\frac{1}{2}$	6	72.00	129.00

**TOOL ROOM SUPERINTENDENTS:**  
BH-59

Make your own grinding fixtures from  
Magna-Lock Standard-size Parallels.

*Hanchett* MAGNA-LOCK CORPORATION BIG RAPIDS, MICHIGAN, U.S.A.

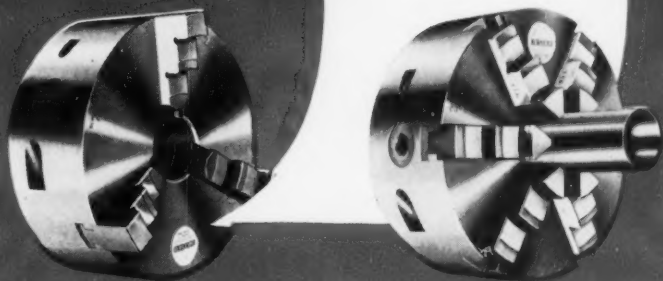
For more data circle 401 on Postpaid Card

**.0002" TIR**



**MEANS UNMATCHED PRECISION**

## **BURNERD GRIPTRU CHUCKS**



Concentricity within .0002" TIR—on one piece or thousands—is the accuracy you can expect and get with Burnerd GRIPTRU chucks.

GRIPTRU's micro-adjusting mechanism eliminates the need for expensive collets, fixtures . . . saves time, speeds output . . . improves the accuracy of any machine tool, new or old. Perfect for tool room or production departments.

And GRIPTRU chucks are built to retain their greater accuracy under the toughest working conditions—Burnerd

chucks are *guaranteed for two years* against defects in materials and workmanship.

But that's not all. When you check prices, you'll be surprised . . . pleasantly surprised. Because GRIPTRU chucks cost you 20 to 30% less!

Other Burnerd chucks—3- and 4-jaw universals, and 4-jaw independents—offer the same outstanding values. Sizes range from 3 1/4" through 28". Get complete details by writing for descriptive literature today.

# **BURNERD** **CHUCKS**

**CLAUSING DIVISION**

ATLAS PRESS COMPANY

5-212 N. PITCHER ST. • KALAMAZOO, MICH.

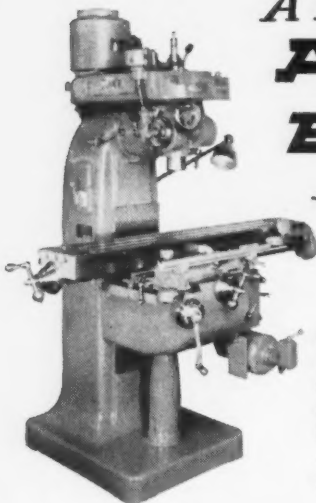
For more data circle 402 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 103

*A Lot More*  
**POWER**

*A Lot More*  
**ACCURACY**  
**ECONOMY too!**

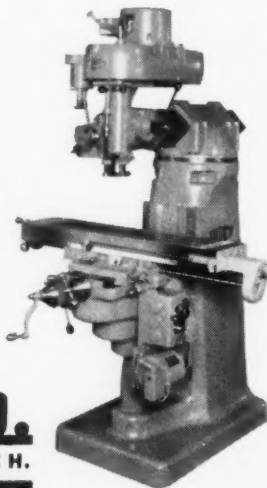


**INDEX "SUPER 55" VERTICAL MILL**

- 1 1/2 HP Head or optional 2 HP with continuous duty motor gives 50% or more capacity . . . More rigidity, more accuracy . . . Increased horse power and dynamically balanced Cast Iron Pulleys and Drive System afford improved production capacity . . . More weight in the column, heavier ribbed column, heavier knee, heavier saddle.

**INDEX "45" VERTICAL MILL**

- Unique square design of overarm affords more rigidity, greater accuracy . . . Provides extra range and capacity . . . More power at the cutter. No adjustment required on overarm and head after use . . . No need to re-indicate head after moving overarm . . . Speed range with nine changes makes possible the use of high speed or carbide tipped cutters to best advantage.



**INDEX MACHINE CO.**

544 N. MECHANIC ST., JACKSON, MICH.

For more data circle 403 on Postpaid Card





# Eclipse

## END MILLS

**TOUGH JOBS—TOP RESULTS!**

- LONGER LIFE
- FINER FINISHES
- LOWER PRODUCTION COSTS

<b>MATERIAL:</b>	Chrome-Vanadium Die Steel
<b>JOB:</b>	Milling pocket, $\frac{1}{2}$ " deep
<b>END MILL:</b>	Eclipse #408, $\frac{1}{2}$ " 4-Flute
<b>SPEED:</b>	45 S.F.P.M. (330 R.P.M.)
<b>FEED:</b>	$3\frac{1}{2}$ in./min.
<b>COOLANT:</b>	Dry

**WRITE FOR CATALOG E-58-M**

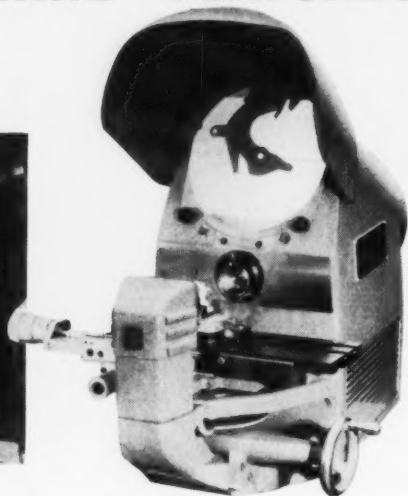
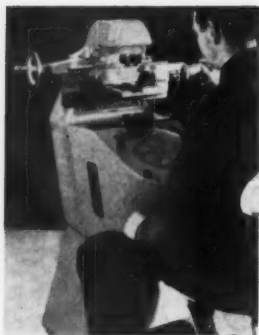


**ECLIPSE COUNTERBORE COMPANY**  
END MILL DIVISION      DETROIT 20, MICH.

For more data circle 404 on Postpaid Card



# J & L presents AN ECONOMY-SIZE OPTICAL COMPARATOR with "BIG MACHINE" FEATURES



Now, for the first time, the most important features of "big" optical comparators have been combined in a relatively inexpensive machine, the J & L TC-10. As a result, medium and small producers can greatly improve their quality control procedures.

The TC-10 offers such features as: direct-reading measuring facilities; density of shadow without distortion; precise optics without adjustment; machine tool design for stability; ease of operation; versatility of application, and assured accuracy.

**BONUS!** The new 5x, 2" aperture lens, especially designed for this machine, provides comparison inspection capacity and accuracy never before available in a machine of this size.

See the TC-10 in operation at Booth No. 1208, ASTE Show or write for folder #GL-6000.

*"the world's oldest and largest maker of optical comparators"*

## JONES & LAMSON

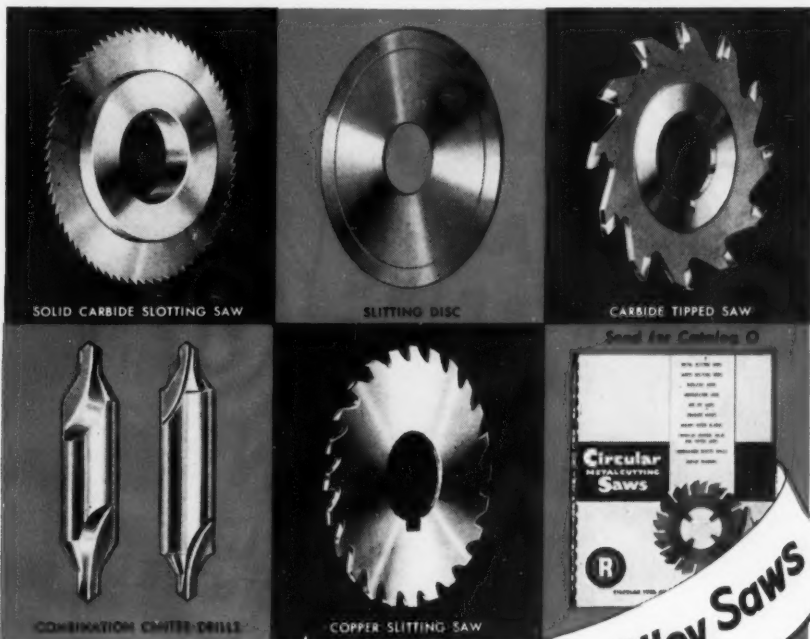
MACHINE COMPANY 520 Clinton Street, Springfield, Vermont



COMPARATOR  
DIVISION

For more data circle 405 on Postpaid Card

**From More Than 1200 ® Catalog Items...**



SOLID CARBIDE SLOTTING SAW

SLITTING DISC

CARBIDE TIPPED SAW

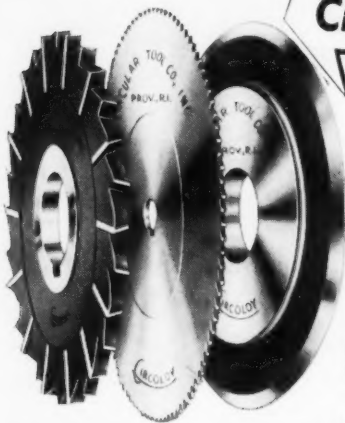
COMBINATION CHISEL-DRILL

COPPER SLITTING SAW

Send for Catalog

**Circoloy Special Alloy Saws**

401-0



**CIRCLE R** Circoloy saws greatly outperform HSS in service life, longer production runs, superior cutting, lower cost—and they're rendered shock-resistant, non-brittle by exclusive Circle R Heat Treating. As catalogued among 1200-plus items, or designed especially on order.

Consult a **CIRCLE R** Specialist in...

BURBANK  
CHICAGO  
CLEVELAND  
DAYTON  
DETROIT  
HACKENSACK

INDIANAPOLIS  
MEMPHIS  
MILWAUKEE  
MONTREAL  
NEW HYDE PARK

NEW YORK CITY  
PHILADELPHIA  
PHOENIX  
PITTSBURGH  
PROVIDENCE  
ROCHESTER

**CIRCULAR TOOL CO., INC.**

PROVIDENCE 5, RHODE ISLAND

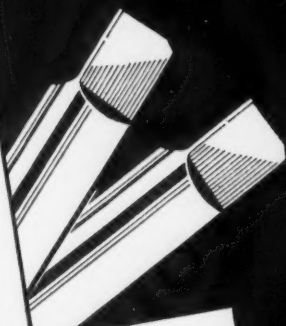
**Specialists in Circular Cutting Tools Since 1923**

METAL SLITTING SAWS • COPPER SLITTING SAWS • SCREW SLOTTING SAWS • COMMUTATOR SLOTTING SAWS • JEWELERS' SLOTTING SAWS • CUT OFF SAWS • CIRCULAR KNIVES & ROTARY SHEAR BLADES • CIRCULOY STEEL SAWS • SOLID & TIPPED TUNGSTEN CARBIDE SAWS • COMBINED DRILLS & COUNTERSINKS • CENTER REAMERS

For more data circle 406 on Postpaid Card

*get*

**GREATER  
RESISTANCE  
TO CHIPPING  
AND BREAKING**



**WITH  
SOSSNER  
TRIPLE  
T T T  
TEMPERED  
TAPS**



Triple Tempering makes SOSSNER taps the toughest taps going. This extra toughness gives you longer life plus trouble-free performance. You get greater resistance to chipping and breaking. Prove it to yourself! Try SOSSNER taps with extra toughness at no extra cost.

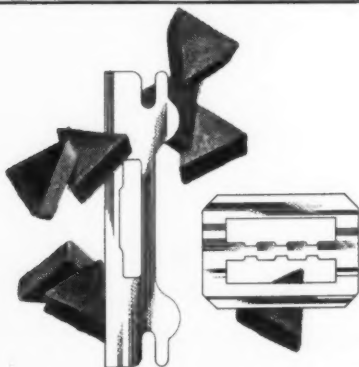
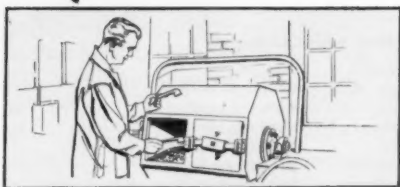
**SOSSNER** TAP & TOOL CORPORATION

29 BROADWAY • LYNBROOK, L.I., N.Y.

FACTORY WAREHOUSES IN NEW YORK • LOS ANGELES • ST. LOUIS • DALLAS

For more data circle 407 on Postpaid Card

# Barrel finishing is best finishing ...for many jobs use **TUMBLEX\* "T"**



Don't let old-fashioned hand-finishing waste your production time and money.

Cut your cost-per-piece-produced by choosing the right barrel finishing equipment.

*Cut this cost to very lowest by choosing the right Norton TUMBLEX abrasive . . . available in five types and many sizes . . . engineered for best results covering the range of barrel finishing.*

For finishing intricate parts, TUMBLEX "T" abrasive comes in triangular, non-wedging shape. It is made of bonded ALUNDUM\* abrasive, assuring "Touch of Gold" performance that includes long, even wear; fine, uniform finish; short time cycles and sure savings.

Send samples of parts you finish to our Sample Processing Department. We'll barrel finish, return samples, and report the methods and abrasive you need to improve quality and cut costs. NORTON COMPANY, General Offices, Worcester 6, Mass. Plants and distributors around the world.

\*Trade-Marks Reg. U. S. Pat. Off. and Foreign Countries

**NORTON**  
ABRASIVES

G-393

**75 years of . . . Making better products . . . to make your products better**

**NORTON PRODUCTS:** Abrasives • Grinding Wheels • Machine Tools • Refractories • Electro-Chemicals

**BEHR-MANNING DIVISION:** Coated Abrasives • Sharpening Stones • Pressure-Sensitive Tapes

For more data circle 408 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 109

## IN PRODUCING PRECISION HOLES—

*he'll produce better assured by a gage*



*that* **TELLS** • exact hole diameter.  
**ALL—** • front or back taper.  
 • ovality.  
 • barrel shape; bell mouth.  
 • "between-pins" on splines.

Slowed production and excessive rejects can often be traced to gaging . . . the operator lacks the assurance of EXACT and COMPLETE KNOWLEDGE of the holes he is producing. Using Comtorplug, he does have exact and complete knowledge, to a fraction of .0001" . . . by a fixed (not passing) reading. Comtorplug's unique expansion principle gives positive 2-point gaging . . . automatically aligned, centered and pressured so that any two people will get the same fixed reading. Exact Gaging Knowledge can stimulate maximum-quantity-and-quality production! Request details from . . . Comtor Company, 64 Farwell Street, Waltham 54, Massachusetts.

### Some firms who control production with Comtorplug

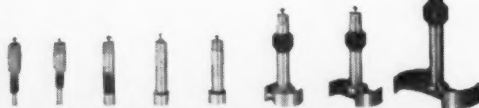
Airesearch Mfg. Co.  
 Allison Div.  
 Apex Electrical Mfg.  
 Buick Motor Div.  
 Century Electric Co.  
 Chicago Pneu. Tool  
 Chrysler Corp.  
 Continental Motors  
 Curtiss-Wright  
 Dana Corporation  
 Detroit Transmission

Douglas Aircraft  
 Fairchild Engine &  
 Airplane Co.  
 Falk Corporation  
 Ford Motor Co.  
 General Electric Co.  
 Hamilton Standard  
 Division  
 Harris Seybold Co.  
 Homelite Corp.  
 Int. Harvester Co.

Lear, Inc.  
 McDonnell Aircraft  
 National Lead  
 Northrop Aircraft  
 Pontiac Motor Div.  
 Scintilla Magneto  
 Steel Products Eng.  
 Studebaker-Packard  
 Sylvania (Atomic Div.)  
 United Airlines  
 Warner Gear Div.



For holes 1/8" to 10" diameter



REQUEST BULLETIN 50 ➡

# COMTORPLUG

with interchangeable expansion plugs to gage  
 simple or special holes to a fraction of .0001".



For more data circle 409 on Postpaid Card

# 3 WAYS

you can use

# WT

ALKER-TURNER

## 20" drill presses to cut costs

Here are three of the many ways you can save money using Walker-Turner "Light Heavyweight" 20" drill presses for drilling and tapping. In standard or special set-ups, these fast, accurate, low-cost tools really pay off in performance. And they offer *extra* value you appreciate because they're built to last—need little maintenance.

See your Walker-Turner Distributor (listed under "TOOLS" or "MACHINE TOOLS" in the Yellow Pages)—he'll show you the full line of W-T 20", 17", 15" and new 14" Hi-Speed drill presses that can help *you* cut costs.



For **FREE CATALOG** of the complete line W-T metalworking tools, write: Rockwell Manufacturing Co., Walker-Turner Division, Dept. WE-22, 400 N. Lexington Ave., Pittsburgh 8, Pa. In Canada: Rockwell Manufacturing Co. of Canada, Ltd., Guelph, Ont.

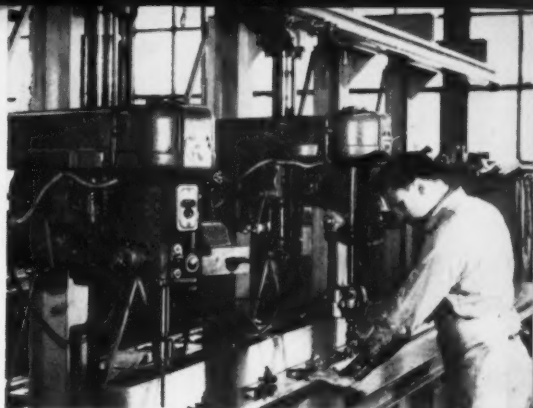
**WALKER-TURNER**  
"LIGHT-HEAVYWEIGHT" MACHINE TOOLS

another fine product by

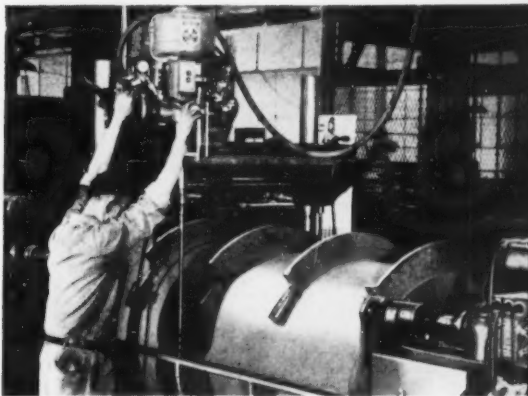
**ROCKWELL**



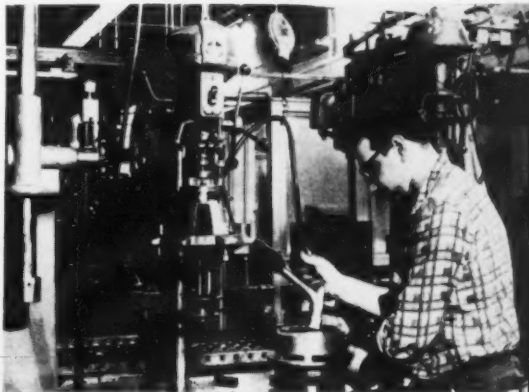
For more data circle 410 on Postpaid Card



Rail mounted standard components



Carriage mounted special set-up



Equipped with multiple spindle attachment



For best results  
in Surface Grinding . . .  
Always Use Blanchard Wheels!

The flexibility in application of your Blanchard Surface Grinder enables you to attain peak production at lowest cost on hundreds of different grinding jobs. *But, it is very important that you use the right wheel for each job!*

Blanchard makes and stocks a great variety of silicate, resinoid and vitrified bonded wheels and segments. Ask your Blanchard representative to help you select the wheel — or wheels — best suited to your requirements. Call or write him today. And may we send you a copy of "The Art of Blanchard Surface Grinding" (4th Edition)?

THE BLANCHARD MACHINE COMPANY  
64 State Street,  
Cambridge 39, Mass., U. S. A.



For more data circle 411 on Postpaid Card



# Now! Finish parts up to 100 times faster with

## AIR-CUSHIONED



... the latest method for cleaning, descaling, deburring, grinding, radiusing, fine-finishing, coloring and burnishing all metal and metal alloy parts, many suitable plastic and ceramic items ... with the Pangborn Air-Cushioned Vibratory Finishing Machine!

The Pangborn Air-Cushioned Vibratory Finishing Machine gives you wider range of application, larger payloads and greatly-reduced time cycles resulting in tremendous savings. It easily handles parts too delicate and intricate to finish by other methods ... works on shielded areas and interior surfaces ... does coarser jobs faster with impressive cost reductions. In 1½, 3, 6, 12 and 18 cu. ft. net capacity sizes. Also auxiliary equipment, media and compounds for every need.

Send parts with exact finish specifications, or finished specimen, for sample processing in our laboratory, to: Mr. Wm. E. Brandt, PANGBORN CORPORATION, 5600 Pangborn Blvd., Hagerstown, Maryland.

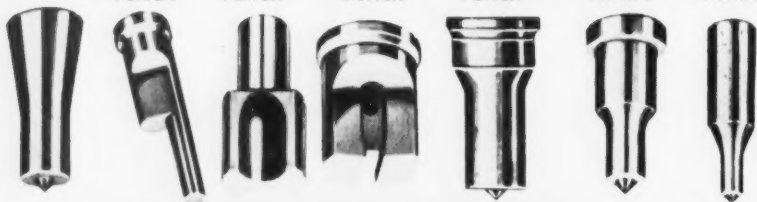
- Works up to 100 times faster than conventional methods; does more work better at lower cost
- Does work impossible to do by barrel finishing or other means
- Most compact vibrator on the market
- Air cushion support and suspension for automatic leveling and amplitude control supplants spring suspension systems subject to fatigue
- Standard basic machines are equipped with mechanically variable speeds
- Floor vibration entirely eliminated, making possible (for the first time) second floor mounting

# Pangborn

OF HAGERSTOWN

For more data circle 412 on Postpaid Card

TAPER SHANK   RIPPING PUNCH   LATTICE BAR PUNCH   TENON PUNCH   POWER PUNCH   HAND SCREW PUNCH   STRAIGHT SHANK



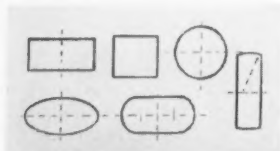
## Cut Costs • Speed Production Specify **CLEVELAND** STANDARD • SPECIAL **PUNCHES and DIES**



From the smallest  
to the LARGEST!

### PROMPT DELIVERY

**Save on inventory!** 400 sizes of 21 standard punches ready for prompt shipment from stock. Save time! Save money!



### Special Punches and Dies

For any of these shapes or for your particular requirements, simply send us your sketch with principal dimensions. You'll be pleased with our prompt delivery.

Write for CLEVELAND's  
Punch and Die  
Handbook No. 12.



Here's **WHY** You Save Money  
Using **CLEVELAND** Punches

### Cut Tool Set-Up Time!

Only with CLEVELAND punches and dies can you punch ANY size hole from  $\frac{1}{8}$ " to  $1\frac{1}{4}$ " with the SAME coupling nut and punch stem! No buttons, no filler blocks, no make-shifts necessary!



**Less Down-Time!** Cleveland punches are interchangeable—quick and easy to insert or remove.

**Last Longer!** Punch or notch sheets, strip, angles, channels or extrusions—you'll find CLEVELAND punches and dies are tough, long-lasting, made to stand up under most severe usage.

**Pay LESS** for Cleveland punches—made in quantity, no stock wasted.

A 204 A

## The **CLEVELAND** PUNCH & SHEAR WORKS CO.

East 40th and St. Clair Avenue • Cleveland 14, Ohio

**Power Presses • Punching Tools and Dies  
Plate and Structural Steel Fabricating Tools**

For more data circle 413 on Postpaid Card

# GET THE NEW, COMPLETE PICTURE

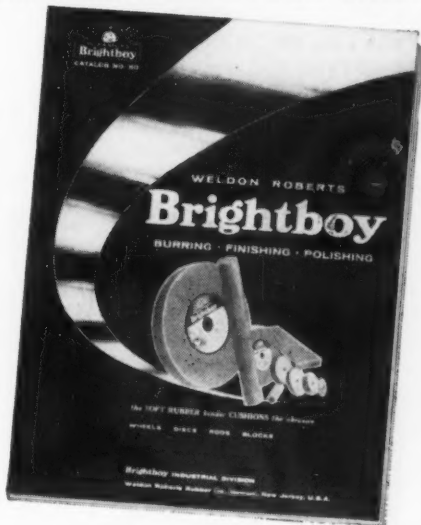
on MULTI-USE, SOFT RUBBER BONDED ABRASIVES  
—THE ONLY COMPLETE, COMPREHENSIVE STOCK LINE!

The revealing, new medium for achieving bigger time savings, improved product quality . . .

—the revolutionary, new concept of abrasive uses!

Yours for the asking, the new Brightboy Catalog contains the latest working data, and product listings . . .

- Brightboy sizes, grains, textures, machine speeds, on all 49 readily available 'Job-Matched' stock compounds for machine and manual operations
- new and revised wheel sizes; center hole specifications conforming to American Standards safety specifications
- refreshing, new methods and applications.



No plant working in metals, wood, plastics or laminated materials should be without this new reference catalog outlining the exceptional advantages of rubber-cushioned abrasives. Write for it.



BRIGHTBOY INDUSTRIAL DIVISION  
WELDON ROBERTS RUBBER CO.

95 North 13th Street

Newark 7, N. J.

America's Pioneer Manufacturer of Rubber Bonded Abrasives

For more data circle 414 on Postpaid Card

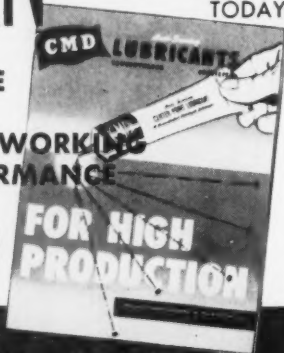
May, 1960

MODERN MACHINE SHOP 115

# PRODUCTION MEN

send for this  
**FREE  
BROCHURE**  
TODAY!

**INSURE  
TOP  
METALWORKING  
PERFORMANCE**



## CMD Anti-Scoring LUBRICANT

HIGH PRESSURE NON-SEIZING

Increase your production with fewer rejects and longer runs. Users report savings up to 81% over conventional lubricants.

Cams	Thrust bearings	Grinding centers
Gear cutting	Broaching	Milling machines
Gear grinding	Die set posts	Screw machines
Machine ways	Deep drawing	Rivet spinning
Steady rest	Band saw guides	Screws and nuts
Swaging	Tapping	Wire drawing
Fla-turning	Lathe centers	Lead screws
Pilot bars	Anti-friction bearings	Stamping
Heavy journals	Extruding	Press fits
Speed reducers	Plug gages	Thread gages

**CHICAGO MANUFACTURING  
& DISTRIBUTING CO.**

1910 West 46th St., Chicago 9, Illinois  
For more data circle 415 on Postpaid Card

116 MODERN MACHINE SHOP

# modern machine shop

## ADVERTISING REPRESENTATIVES

**John M. Krings, Vice President,** Room 211-A, 540 N. Michigan Ave., Chicago 11, Illinois, DElaware 7-5441. Western Michigan, Illinois, Wisconsin, Iowa, Minnesota, the Dakotas, Northern Indiana.

**George E. Hay,** 431 Main St., Cincinnati 2, Ohio, CHerry 1-5924. Western Pennsylvania, Western New York, Ohio, Kentucky, Southern Indiana.

**Jeryl L. Marlatt,** 1051 Brooklawn Rd., Birmingham, Mich., Midwest 6-5935. Eastern Michigan, Northwest Ohio.

**Norman S. Rogers,** 431 Main Street, Cincinnati 2, Ohio, CHerry 1-5924. Central Indiana.

**Gene J. Schwarber, Advertising Manager,** 431 Main Street, Cincinnati 2, Ohio, CHerry 1-5924. Missouri, Kansas.

**Duncan W. Barton,** 60 E. 42nd St., New York 17, N. Y., Murray Hill 7-7390. Eastern Pennsylvania, Central New York State, New Jersey, Maryland, Delaware, Washington, D. C., Long Island, Brooklyn.

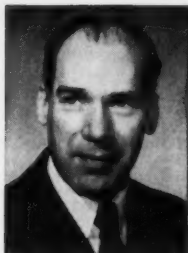
**Granville M. Fillmore, Vice President,** 60 E. 42nd St., New York 17, N. Y., Murray Hill 7-7390. Eastern New York State, Connecticut, Massachusetts, Rhode Island, Vermont, New Hampshire, Maine.

**The Robert W. Walker Company,** 730 South Western Ave., Los Angeles 5, Calif., DUNKirk 7-4388, 57 Post St., San Francisco 4, Calif., SUTter 1-5568. California, Oregon, Washington.

★ ★ ★ ★

**Circulation over 54,000—  
largest in metalworking field**

May, 1960



Fred W. Vogel

## Over the Editor's Desk

### LITERARY TOUCH

Paul C. Bruhl, one of our many good readers from Detroit, sent us the following message last month, "I have enjoyed reading your valuable magazine for many years. For some time I have been thinking about a short and pointed statement which would emphasize the target of the activities covered in the machine tool and equipment marketing field. I, therefore, would like to submit the following for your consideration:

A MAN WITHOUT TOOLS IS SO FEEBLE,  
SO UNFIT, SO HELPLESS AND SMALL.  
BUT GIVE HIM THE TOOLS AND YOU MAKE HIM,  
A GIANT—THE MASTER OF ALL."

Take our word for it, Mr. Bruhl's couplet is most worthy of consideration, especially by those who have lost the vision of the basis of our enormous mechanical might.

★ ★ ★ modern machine shop ★ ★ ★

### THE NEXT FORTY

Here's an item to save and look at again if you should ever begin to lose faith in future business prospects. The construction industry expects to build the equivalent of an entire new nation before the end of this century.

Every home, office building, store, school—virtually anything you can name except the monuments—will be more than duplicated. And all within the life of today's 40-year mortgage. The cost will be a trillion dollars. These estimates emerged at a recent National Construction Industry Conference sponsored by the Chamber of Commerce of the United States.

Think of the impact of such a boom in a single industry. And then try to imagine your own line of business standing still in such an upheaval.

## Over the Editor's Desk . . .

### AMERICAN DOLLAR

According to a recent report, the American dollar is worth less today than at any time in history; it is worth less than when the Constitution was adopted. In this 20th Century, within the lifetime of many persons still working, the purchasing power of the dollar has dropped from 100 cents to less than 29 cents. The value of savings and pensions and insurance has dropped accordingly.

Actually, the lowering of the value of the dollar is how inflation destroys the rewards of hard work and thrift. This is how prices have been pushed up. This is one reason that taxes keep going up. This is a fact of life that should be thoroughly understood by every American.

The chief cause of inflation is not hard to identify. It is excessive, deficit spending by the federal government. Certainly then, it is the responsibility of every citizen to let his legislators know that wasteful spending must be curtailed.

★ ★ ★ modern machine shop ★ ★ ★

### SAD BUT TRUE

One reason why the United States has been lagging behind other nations in plant modernization is because of our obsolete Federal tax policy with respect to depreciation allowances.

In the U. S., write-off periods for machine tools vary from 15 to 33½ years. It is now possible, by submitting specific proof to the Internal Revenue Service, to do better than that. But there are thousands of companies in this country still taking an annual 5 percent write-off.

This is a deterrent to modernization. By contrast to our system, foreign systems are characterized by shorter write-off periods and by special depreciation allowances serving as incentives to modernization.

It is hoped that the Congress will take cognizance of the present situation, and liberalize provisions governing depreciation so that American manufacturers will be permitted write-offs comparable to those allowed competitors in other countries. Our present policies act as a brake upon modernization. What we need, to compete with the rest of the world, is just the opposite. We need provisions that will serve as a stimulant and help to accelerate plant modernization.



# look man- NO HANDS!

**DRILL PRESSES  
BECOME  
AUTOMATIC**



with ...

## DUMORE AUTOMATIC DRILLING UNITS

do all these jobs, and more . . . TAP • DRILL • REAM • CHAMFER  
• SPOT-FACE • CENTER • DE-BURR even in stainless steel.

**COMPLETELY AUTOMATIC** . . . just plug in and they're ready to go  
. . . all controls built in. Unskilled labor can learn to operate in  
minutes. Actuation by foot switch leaves both hands free for parts  
loading, positioning, unloading. Capacity from No. 60 to  $\frac{3}{8}$ " for  
drilling, or No. 0-80 to  $\frac{1}{2}$ "-20 tapping in steel.

**ASK YOUR LOCAL DUMORE INDUSTRIAL SUPPLY DISTRIBUTOR**

for a demonstration, now. 3 models to choose from, priced from \$418, FOB  
Racine, complete with all components including motor, ready to operate.



You can **DO MORE** with

# DUMORE

All Purpose  
Precision  
Metalworking  
Tools

Versa-Mil • Drill-N-Tap Units • Drilling  
Units • Drill Heads • Micro-Drills • Drill  
Grinders • Precision Grinders • Hand  
Grinders • Flex-Shaft Tools • Quills and  
Accessories

**THE DUMORE COMPANY • 1302 Seventeenth St., Racine, Wisconsin**  
For more data circle 416 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 119





## **Report from Washington**

### **on Events Which May Affect You and Your Job**

● **SALES THIS YEAR OF TAPE-CONTROLLED MACHINE TOOLS** will be rising fast. Deliveries are expected to go up to around \$20 million from the small total of last year. Sales in 1961 are expected to at least double. The big gains will be coming in jig borers, presses, turret lathes, grinders, and milling machines. They'll be installed in a wide range of metalworking plants. Main benefits for users will be lower wage costs and large savings on cutting parts.

● **YOUR FEDERAL INCOME TAXES WILL PROBABLY BE CUT** next year, if current political and economic trends only persist. The U. S. Budget is getting into the best shape of any time since the end of World War II. Continuing good times are boosting profits and incomes—and the Treasury's revenue receipts. At the same time, according to recent surveys, members of Congress *want* to grant relief—once at least part of the huge federal debt has been paid off. What's more, if a recession should develop, cuts would help boost business. Here's the way the black ink will be growing in coming years: In fiscal 1960, the year we are now in, the Budget should be just about balanced, with spending and outgo at \$78.5 billion. In fiscal 1961, a surplus of around \$3 billion is anticipated. U. S. spending will be up a little, revenue quite a bit more. The next year, fiscal 1962, the surplus could jump to around \$7 to \$8 billion, if business continues good. Receipts would be way up while Federal spending would again rise very little. The 1962 federal budget will go to Congress early next January. And if a \$7-\$8 billion surplus is indicated, Congress will be ready to approve tax changes, in advance of actual surpluses.

Here's the way Congressmen think that the cuts should be made: Individuals should be taken care of first. That's normal with Congressmen; they

favor the voters and they have the idea that such cuts can stave off a recession. Cuts might be 10% or so. Corporations should get some relief too, if the surplus turns out to be large enough. A cut from 52% to 50% might be voted. Manufacturers, also, might be given some relief on the excises they now pay, especially those excises which were approved during the Korean War. Cuts could reach \$4-\$5 billion, with some left for debt payment.

● **NO CHANGES IN GOVERNMENT PATENTS POLICIES** are likely to be approved by Congress this year. This will be disappointing news to many companies now working on U.S. contracts. They now have a few rights in inventions developed in fulfilling these jobs. But in many cases the title goes to the government, which will offer these patents, royalty-free, to all of American industry. What contractors want is private control, with only the U.S. having free use. Senate antitrust leaders are reluctant to give industry the rights to patents without prior review by the Department of Justice and the National Science Foundation. Time will run out this session before a compromise can be reached. Patents on space, medical, and atomic energy contracts are involved.

● **THE JOB OUTLOOK FOR COLLEGE GRADUATES IS GOOD** this year, probably the best ever. Both university officials and industry recruiters agree on this, on the basis of preliminary soundings that were conducted during the Spring. For one thing, demand is increasing. The federal government is aggressively seeking young technical and scientific workers—the ones industry wants most. As a result, the number recruited out of universities will rise 20% over '59. Starting pay for engineers and scientists will be up by 6% this year, to around \$490 a month. Graduates in business administration will be getting about 3% more. Though the recruiting by the federal establishments is currently being stepped up, starting salaries are 15% under industry's.

● **PRICE INCREASES THIS YEAR WILL BE MODERATE**, in the view of government experts. Budget surpluses, competition, and prospects of business leveling are helping. Gains probably will be greater at the consumer level than at wholesale. Though the rises will be small over-all, they'll be widespread. At retail, gains may average a little more than 1%. Food won't go up at the 2% to 3% rate of recent years, while clothing will be costing about 1% more. Dealer discounts on new cars will hold prices

## Report from Washington . . .

down. But higher local taxes will boost prices on many items. Medical costs will rise. At wholesale, the price hikes will average a little under 1%, with farm products easing and metal products going up. A fall in home-building will keep building materials from rising over-all. Machinery prices, though, will increase. The costs of services will continue to show 2 percent to 3 percent gains.

● **EXPANSION OF THE MINIMUM WAGE LAW WILL BE VOTED** by Congress this year. But, there will be a big fight over how it will be done. The Democrats want to extend coverage to some 10 million more workers in retailing, in services, in local transit, and building trades. They also want to raise the minimum from \$1 to \$1.25 per hour. President Eisenhower and his advisers, however, favor a more moderate increase to, say, \$1.10 an hour. And they would rather extend the coverage of the wage-hour laws to only a small number of workers. In the end, Eisenhower's position probably will be the one that prevails. If any bill passes, it will provide for a compromise covering less than 5 million workers. And some exceptions may be made for firms grossing under \$750,000.

● **A SHIFT TOWARD EASIER CREDIT MAY NOW BE UNDER WAY**, judging from recent developments. The tightenings of recent years may at least be reaching an end. This does not mean that you will see a sudden easing in rates and the supply or that credit conditions will return to the ease of the early 1950's. Though the worst of the tightness may be behind us, coming changes will be slight. There are four factors behind the shift that's now in process: The Budget surplus that is coming will act as a deflationary influence; the Treasury will take in more than it will spend. Recent business trends don't show the large expansion that was anticipated at the beginning of the year. Industrial output is leveling out while auto sales are not as high as hoped for. Commercial loans are not rising at the rate anticipated though it should be noted that they have begun to show some strength. The Federal Reserve is showing a new attitude, reflecting the fear that continued tightness may hasten a business leveling. In the months ahead, banks may not cut rates but they will treat customers more generously, upgrading to better risk categories.

# ARMSTRONG

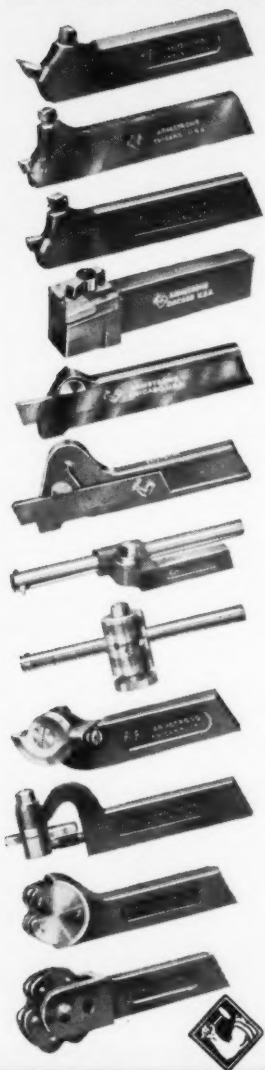
## TOOL HOLDERS

### A Correct Tool for Every Lathe Operation

You can save time (and money) by ensuring that your machine tools are equipped with *adequate numbers* of the correct ARMSTRONG Tool Holders. The ARMSTRONG System of Tool Holders includes correctly designed tools for *every* standard operation on lathes, shapers, and planers, and for many operations on turret lathes and screw machines. By utilizing the ARMSTRONG System of Tool Holders, you can reduce tooling costs, eliminate down time in tooling up, operate your machine tools at maximum feeds and speeds.

ARMSTRONG Tool Holders are long-lasting tools. They are strong beyond need, handy and efficient, profitable to use, and are readily available from your local ARMSTRONG Distributor.

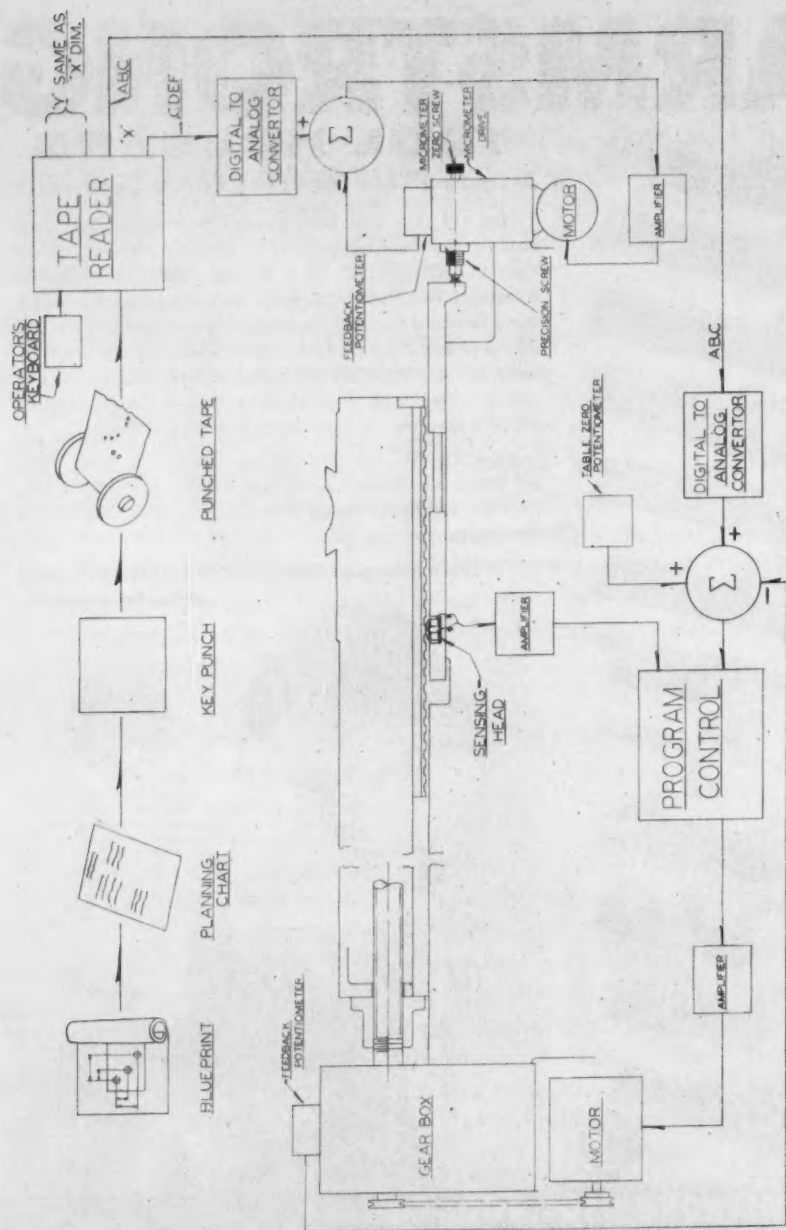
Check over your ARMSTRONG Tool Holder needs.  
Write for literature.



If you do not know the name  
of your local ARMSTRONG  
Distributor, inquire when  
asking for literature.

**ARMSTRONG BROS. TOOL CO.** 5228 W. ARMSTRONG AVE. CHICAGO 46, ILL.

For more data circle 417 on Postpaid Card





**Manufacturers who hope to keep production  
in line with demand must study economic  
advantages of automatic control.**

By M. H. SLUIS  
Project Engineer, Pratt & Whitney Company, Inc.

**Tape control of machine tools, or numerical control as the trade likes to call it,** is the most recent step in that phase of manufacturing evolution known as automation. Even in its brief existence, more accomplishment and notoriety has been attributed to "automation" than to the industrial revolution that has been so well known to us all from our history books. Tape or numerical control is merely a method of addressing a machine tool. Tape or numerical control refers to the means of initiating or perpetuating a machining cycle. The degree of automaticity of the tool so commanded varies directly with the extent and complexity of its servo system.

The control system on a Pratt & Whitney tracer controlled milling machine, for example, is dependent

upon the ability of an electromechanical tracer to follow the contours of a model which are a replica of the shape desired in the final part. The operator of such a machine merely makes proper settings of the controls at the initiation of the job. Thereafter with only minor corrections of the control, if any, the machine performs as a closed loop system. In this instance it is clear that the addition of tape control hardly advanced the degree of automation. Its by-product, however, did tighten the already existent servo loop and made possible the realization of a much more efficient machining cycle as well as the complete elimination of the tracer and the model.

In place of the tracer and model is a rather complex electronic control and hydraulic drive system which



**"The controls are, of necessity, quite elaborate."**

enables the programmer to dictate the machine's contouring and 3-dimensional milling cuts with an ultimate efficiency and an elimination of errors. One might well question the latter statement in view of the fact that the basic machine's cutting abilities were left undisturbed. From repeated evidence gathered from users' plants, however, it has become obvious that tracer type "Keller" machines—this is Pratt & Whitney's trade name for tracer-controlled milling machines—for one reason or another are not being utilized at their highest efficiency. This is a factor that can only be controlled by the operating settings of the control system; i.e., the speeds, feeds, tracer gap tolerances, spindle speeds and a number of other variables. By taking away from the operator all of these factors it can be seen that nothing can deter the machine's programmed desire to perform to its full capacity and ability.

**The controls** which enable continuous monitoring and correction of a machine tool through a complex path are, of necessity, quite elaborate. The approximation of such an electrical system to that employed by computer techniques makes it prohibitively priced as a research or development project to be undertaken, individually, by those machine tool manufacturers desiring to market such a system. It is for this reason that, almost without exception, continuous path machines on the market today are having their control systems provided for them by firms outside the tool industry. In addition to the complex control system of the

tool itself, it is necessary for the tape preparation acceptable to such a machine to be performed by at least a moderately sized digital computer. Obviously such tapes may be prepared for tool users by centralized sources such as Pratt & Whitney who own such computers and have in their employ people experienced with the particular type of programming.

**The basic philosophy** of milling machine programming is that any shape to be desired can be expressed by a series of coordinates. These in turn are specified by means of numbers. The desired accuracy of the machine performance is therefore determined by the number of specified coordinates and the rapidity with which the machine control and, of course, the machine itself can follow the subsequent series of commands. The computer's main function in the picture is to calculate the necessary cutting tool offset as determined by its size and shape and the description of the path which the tool is to follow. In addition, it has the ability to fair the contours between coordinates so that the machining results in a smooth path. The machine slide speeds are governed not only by the tool and the material but by the complexity of the path to be followed as well. It is obvious that a much more rapid cut can be achieved on a straight line or a uniformly, continuously variable function than could be maintained with any degree of accuracy when performing step functions such as negotiating 90-degree corners.

**A tape, when inserted** in the control system of the machine, ad-



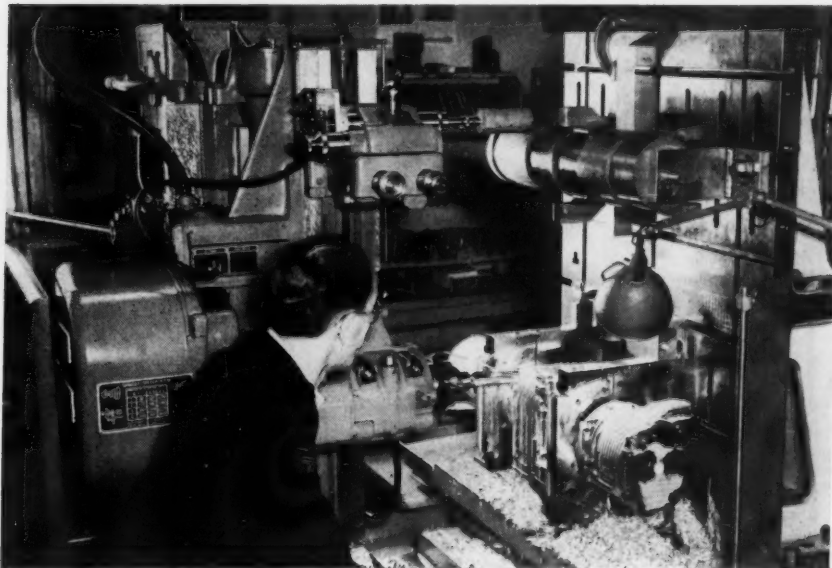
vances at approximately the same rate as the rate of change of the coordinate command. This is in opposition to the technique used in the positioning system whose description will follow later, where a complete block of dimensional data is read, stored and then acted upon in its entirety.

A Keller machine represents what is known as a continuous positioning system whereas positioning tables are referred to as point-to-point positioning devices. This graduation is inherent in the nature of the process performed by each of these tools. The third classification is one which encompasses machines which may be controlled by tape and performing straight lines or a series of straight line operations such as a lathe.

In the development of a positioning system, the jig boring and

grinding machines presented dual problems, since the operator of such a "manual" machine commonly performs two distinct and different processes. The first of these steps is the positioning of the workpiece to the proper point underneath the spindle. The boring, drilling or other metal removing operation would then follow. The latter step could well be referred to as the one which more truly utilized a machinist's skills. Since a natural split existed between the functions performed on such devices, our efforts to tape control boring and grinding machines for instance, were divided in a two-step design.

**For years it has been many a foreman's dismay** that jig borer operators would idle say a \$50,000 machine while using its work surfaces as a table upon which to rest and



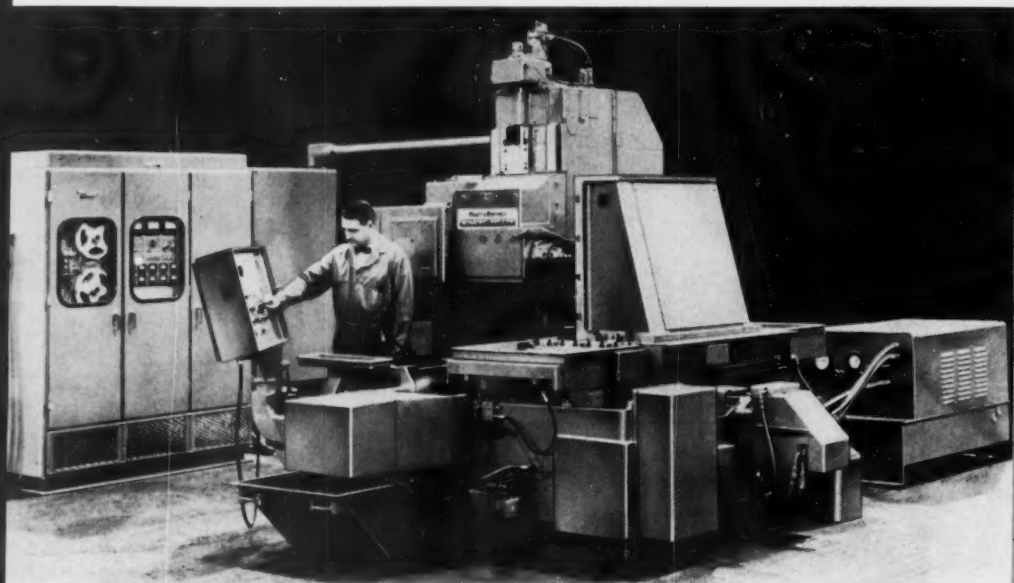
**KELLER** tracer-controlled machine produced by Pratt & Whitney Company, Incorporated.

**"Any error at such a time would be most costly."**

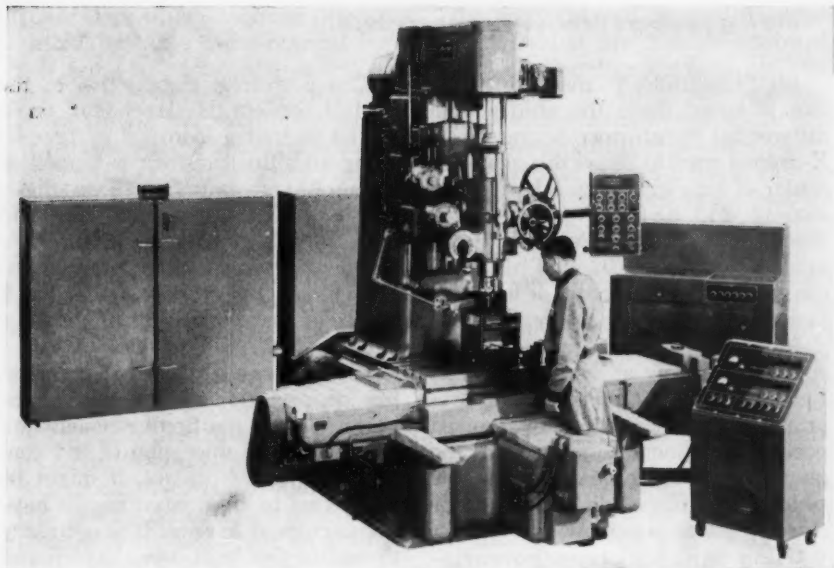
study a complex blueprint in order to determine the desired precise position of the machine slides. Not only was the process of blueprint reading a time-consuming one, but the very act of positioning such tool slides with accuracy required some skill and, believe it or not, steady nerves. You can well picture the nervous tension as the last of a series of holes is to be made in a fixture whose accumulated machining has raised its cost to several thousand dollars. Any error at such a time would be most costly.

About three years ago we marketed point-to-point positioning machines, thereby taking away completely step number 1 from the operator's guidance. All things con-

sidered, this in itself was not really a difficult problem. At the outset it was decided to build a special purpose computer-like control which would present a fixed positioning sequence to each of the two slides in much the same manner as the operator had been doing it previously. This entails always approaching a final set point in the same direction, in order to equalize mechanical strains, clamping the slide when this position is reached and releasing the windup from the machine driving members so that ensuing machining forces would not upset the slide position. In indicating that this problem was not difficult, it is necessary to realize that the precision measuring system for many years installed on



**NUMERIC-KELLER—Pratt & Whitney's continuous patch, numerically-controlled machine.**



*Illustration showing view of Pratt & Whitney No. 2E numerically-controlled jig borer.*

manual machines could be retained intact and merely required the addition of automatic motivation.

**The total act performed by the machine** is merely the selection of one particular point amongst 86 trillion possibilities ( $86 \times 10^9$ ). This action might be likened to the selection of a single BB shot (1/16-inch diameter) from an area of BB's covering 600 x 400 yards. In the larger machine which we produced later, this becomes an area of  $\frac{3}{4} \times \frac{1}{2}$  mile. Needless to say, none of us, including the machine, would live long enough to test the veracity of each and every possible combination. The complete performance of this selection task from the initiation of tape reading to the lighting of a green light, to indicate completion of positioning cycle, takes place in a matter

of 15 seconds or thereabouts, depending upon the distances the slides are required to move.

Since precision setting to an accuracy of a tenth of a thousandth of an inch was necessary, it can be realized that final approach speeds to such a point would of necessity have to be quite slow. This indicates the need for a multiplicity of available positioning speeds dependent upon the proximity of the final resting place. This need brought about the development of a drive system for jig borers consisting of one fixed speed a. c. motor, a variable speed d.c. motor which in addition to two clutch ranges has armature control that provides an additional preset speed. This adds up to a total of four slide speeds in one direction of approach and three speeds in the other mode.

## **"One lug appears precisely at every inch."**

An "Electrolimit" measuring system is based upon the ability of a differential transformer wound on an E-shaped core to sense the magnetic center of lugs spaced on a bar. Hand stoning and optical comparison checking lend great precision to the intervals between lugs. The bars containing these cutouts, or lugs, are fastened underneath each moving slide of the machine tool. One lug appears precisely at every inch. The E-shaped core is offset the appropriate decimal portion of desired positioning dimension and selects the precise lug, underneath the table which, when placed directly over this core, gives the set point.

**Using a helical type potentiometer**, geared to the drive shaft of the machine, a good indication is fed back when the proper lug is within focusing range of the coil. The slide is then turned over to the command of a bridge null detecting circuit which can sense when the magnetic center of the lug is precisely over the differential transformer core.

No one mechanical or electrical device could achieve the ability to position this E-core to an accuracy predicated by the fourth decimal point. This would mean a discrimination of one part in ten thousand. To overcome this problem, the 4 digits following the decimal point have been divided into two equal groups termed coarse and fine. These two divisions consist of two identical drive systems and again helical potentiometer feedbacks. The combined drive outputs are added by a precision differential and will effectively move the E-core its necessary total distance.

The numerical data input to the control system is dependent on a digital-to-analog conversion process using an auto transformer tapped at equal 10-volt intervals. Two digits worth of analogs are summed and used as one of the two inputs to a comparator circuit. The other input consists of the particular feedback device of that portion of the machine slide control.

**With several years of operating experience** in the field of the point-to-point positioning system and about a years' operation of the continuous type of control, it might be of interest to know what results have been achieved to date. It is necessary to realize *first* that users have found numerical machines as useful on "one-shot" type jobs as they have on large production runs. Customers of our equipment vary from the very largest manufacturing operations to the very smallest of job shop subcontractors. Among the generally achieved benefits of numerical control, we can list not only reduced cost but reduced lead time, improved quality, reduced tooling and, above, all, increased productivity.

One statement that applies to any system of numerical control (be it ours or some one else's) is that the cost of the tool so equipped exceeds that of the manual machines it is replacing, by a considerable margin. In order to justify this additional expense, various actual case histories can be quoted showing that an excellent return on this money can be realized.

Typical among these examples would be the case of the digital com-

puter part which required 30 hours' machining time using manual methods but was reduced to a 7½-hour job with numerical positioning control. Among our own customers, at least one small subcontractor has replaced two jig borers of the manual variety with one numerically controlled machine. On a production job in our own factory, we have realized a 4:1 saving on a particularly intricate gear case machining job. One aircraft engine component manufacturer reported to us a cut of machining time of 46 percent, with scrap rate reduced to non-existence.

**Considering savings produced** by continuous positioning systems, it is important to realize that methods can now be utilized which heretofore had been unheard of. As an example,

the production of internal threads in parts which are not symmetrically shaped, therefore hard or just plain impossible to turn, has been done successfully in our own shop. In many instances, multiple operation such as drilling and pocket milling can now be performed on one single machine, saving the setup time as well as transportation between departments. Again, during our own machining of the base casting of our rotary tables, we require a zigzag like pattern of oil grooves. Normal milling time required is on the order of 5¼ hours. Using tape control, these grooves are now cut in just over two hours per table.

These are only a few of the actual examples illustrating the direct economic advantages of tape control. In addition, of course, reduction of scrap



Operator is shown at the push-button panel of P&W numerically-controlled rotary table.



**"Our automobile industry is probably the most automated one."**

rate, inspection time, and a host of other allied processes benefit greatly.

Our emphasis concerning economics so far has been based upon an analysis from a management's point of view. Perhaps as important is the impact upon our general economy and the results upon our labor force. Our present day and age of ever advancing economic well-being hardly appears to require automation's help. Despite the fact that our automobile industry, however, is probably the most automated one, it employs 920,000 people. It is difficult to understand how so many can make a living out of something nobody has paid for.

**Recent publicity has appeared** in all our communication media concerning the population increase of our planet. Taking a look merely at the United States, 1950 (the last census year) employment in manufacturing accounted for about one-fourth of our total employment figure. Extrapolating the curves established by the economists, in 1975 it would mean industry would have only a little more than 22 million people available to turn out all manufactured products. This represents an increase of 35 percent in the labor force. Using the same type of prediction, however, the gross national product will have risen in the same period of time from 400 billion dollars to 700 billion dollars—an increase of 82 percent. It requires no complex mathematics to conclude that by 1975 we will be turning out such a volume of goods and devices, we will be hard pressed to find enough men and women to do the work. The

obvious conclusion is that productivity per man must be very substantially stepped up. This cannot be done by the equipment of yesterday or even today. Numerical control and its increase of machines' automation, as mentioned earlier, is only one necessary step to attain the goals of our economy.

We have talked thus far in large part about Pratt & Whitney's role in machine tool control progress. A little less than a year ago, however, there were on the market thirty-one recognized concerns producing numerically controlled point-to-point positioning systems. In addition, there are a dozen additional continuous path control systems available.

**Typical of our capitalistic system,** each of these firms has individually attacked and resolved the problems presented. Obvious also, despite their approach deviations, are a great number of similarities to be observed as well. The most important parts of any of these systems are the feedback transducers or measuring devices. These can be classified into seven major groups.

First, among these classes, is the digitizing disc. This type of device can take many actual forms but, in principle, its very title exemplifies its function. If attached to a lead screw, it will feed its error signal to a comparator, analogue-digital conversion being performed by the device directly at the source of information.

A second classification of transducing devices is known as synchros. This type of unit can translate a rotational displacement to a corresponding analogue voltage. A third

type of device can be classified as a multipole resolver. In this category one of the better known devices has been named the Inductosyn and is manufactured by Farrand Optical Company. This device can be made in a linear or rotary form. The portion of the Inductosyn attached to the machine tool slide has engraved on glass, two separate hairpin windings, one interleaved with the other and spaced 90 electrical degrees from it. The spacing is such as to provide two separate turn windings or four poles corresponding to 0.1 inch of the slider. When the scale winding is energized, the sine cosine outputs of the slider winding will go through a complete cycle—360 degrees—for every 0.1 inch of movement of the slider past the scale. By using a coarse and fine system, total accuracy can be had in 0.0001-inch increments.

**A fourth system might be described** as an optical or defraction grating transducer. By superimposing two sections of glass plates having lines engraved upon them, a pattern can be obtained which effectively magnifies the spacing of the lines on the grating so that a photoelectric cell may observe a movement, parallel and perpendicular, to the length of the grating lines. A fifth system, which is completely analogue and quite simply to apply, would utilize devices such as potentiometers, variable transformers, and so on, geared to drive members. The sixth and seventh systems are closely allied in some instances. One of them might be known as differential transformer transducers, the other as measuring bars. One of our competitive jig borer manufacturers uses end measures or gage rods which are automatically selected and put in physical contact

in order to provide a proper length bar as a measuring reference. Our own Pratt & Whitney Electrolimit system utilizes a measuring bar along with a differential transformer. Canadian Westinghouse has been marketing a system using a differential transformer trade named "Nultrax". This employs a primary transformer coil wound on a bar equivalent in length to the maximum desired slide movement and carries over it a sleeve which has a secondary coil wound on it.

In addition to those machines manufactured and marketed in this country, it is significant to note that similar, very excellent competitive progress is coming from all parts of the globe. Manufacturing and labor costs being what they are in the U. S., this will mean an ever-tightening market of domestically produced automatic machines in relation to those units available for importation.



*Work quality improves under numerical control because the operator is freed from "bookkeeping" duties and can thus concentrate his attention on the cutting action.*



# How to Heat-Treat Thin-Gauge Aluminum Sheets without Distortion

***Specially developed spacer springs solve distortion problem in heat treating aluminum sheets ten to sixty thousandths of an inch thick.***

**The problem was to heat-treat thin-gauge aluminum sheet that didn't want to stand still for that kind of treatment. The solution is a new**



**Spacer springs hold coiled aluminum sheet firmly in position on racks during the furnace quenching phases of heat-treating.**

**technique, utilizing spacer springs of die steel, developed by manufacturing research engineers of the Boeing Aero-Space Division.**

Eliminating heat-treat distortion in aluminum sheets, ten to sixty thousandths of an inch thick, long has been a trouble spot in aircraft manufacturing history. General-purpose aluminum-heat-treat furnaces, where the sheets are processed to the strength and durability necessary for high-performance aircraft, usually have heavy-bottomed racks of steel mesh and structural members. When the racks, with sheets suspended by overhead clamps, were plunged into the cold water quenching bath, their bulk created a turbulence that often warped thin sheets and tore them from their supports.

Another method tried was to coil the sheets and load them upright on the racks. When this was done, some highly stressed sheets uncoiled during heat-treatment, resulting in whiplash damage and subsequent warpage, or metal-to-metal contact that caused weak spots. If the coils

were tied or clamped, again there was metal-to-metal contact as the coil was compressed; uniform heat transfer was impeded, proper flow of quench water was interrupted, and lowered mechanical properties and warpage of the sheets heat treated frequently resulted.

A method had to be found to restrain the coiled sheets and, at the same time, prevent metal-to-metal contact. Engineers Clayton Ruud and Don Heinrich found the solution in specially developed spacer springs made of H-11 die steel, inserted at top and bottom of a coiled sheet. The springs are first stretched to facilitate coil placement and then tension is released so as to fix the coil firmly in position. Best spring size for

handling aluminum sheets was found to be 8 inches in length and 1-inch outside diameter, of 0.063-inch wire. Extensive testing in production furnaces proved that the springs retained their tension through hundreds of heat-treat cycles.

Today, after several months of production use, the new technique is established as satisfactory in all respects: ease of application, economical handling and reliability. The new springs hold coiled aluminum sheets firmly in position on heat-treat racks, with space between coils that insures uniform heat distribution and quench-water circulation. The end result is claimed to be improved quality and fewer rejections.

*(Reprinted from "Boeing Magazine")*

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

## Machining Moly Jetavator Housing

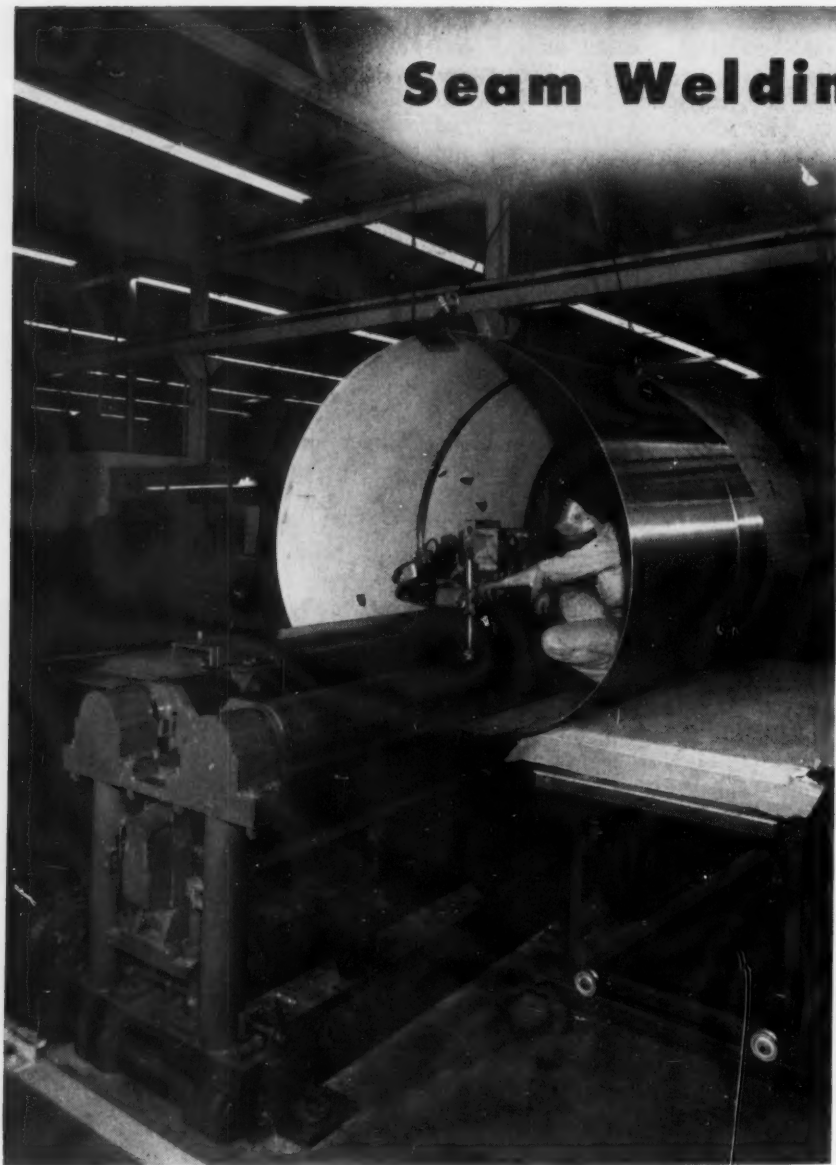
**Considered impractical just a few months ago**, accurate contour machining of forged, pure molybdenum jetavator housings—used to control the direction of rocket engine thrust—is now handled on a production basis at Custom Tool & Manufacturing Company, Minneapolis, Minnesota.

In the accompanying illustration, the jetavator support bosses are being contoured on a Gorton 3D Mill equipped with a True-Trace attachment. This job is completed in two passes, using a high speed steel two-flute end mill cutter. Tolerances of plus or minus 0.001 inch must be maintained, with a specified surface finish of 63 micro r.m.s. However, Custom Tool says it is achieving 40 micros in moly with this setup.



Setup used at Custom Tool and Manufacturing Company for accurate contour machining of forged molybdenum jetavator housings.

# Seam Welding



*Huge cylindrical shape is shown in the process of being welded on the new butt welder. Size of cylindrical shapes is limited only by distance to the roof above the machine.*

# Goes BIG Time

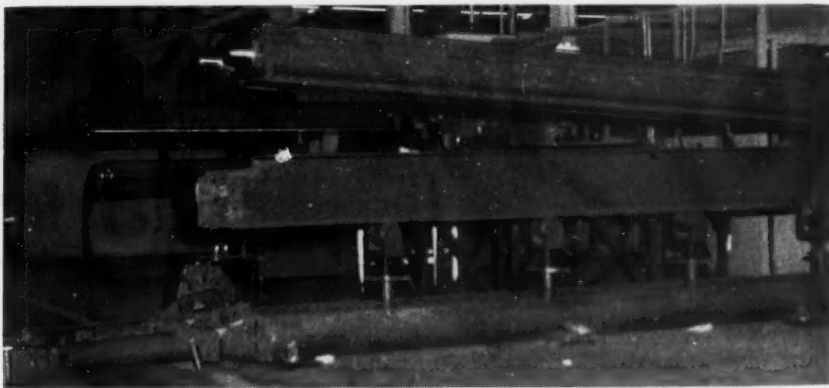
**Huge butt welder will handle cylindrical shapes of a diameter limited only by distance to roof above welder's location.**

By GILBERT C. CLOSE  
Field Editor, Modern Machine Shop

**The size barrier in automatic butt seam welding was breached** recently by what is considered to be the world's largest automatic butt seam welder of its type, designed and built by Airline Welding and Engineering Company, Gardena, California. This machine, weighing 15 tons and costing approximately \$50,000, will automatically butt weld a continuous seam 16 feet 3 inches in length, and will handle cylindrical shapes of a diameter that is limited only by the distance to the plant roof above the welder's location.

The welder incorporates many innovations in design which make the handling of such sizes practical. Chief among these is the hydraulic mechanism for tilting the table top upward 10 degrees at one end, thus making it possible to slip cylindrical structures out of the machine over one end of the table, much like removing a small paper cylinder from a pair of scissors merely by slipping it off one of the blades.

To accomplish this machine opening and closing, the end gate on the outer end is first folded flat against



*Here, the table top of the huge automatic butt seam welder has been opened to 10 degrees. This allows for easy removal of cylindrical shapes after closure by final weld.*

**"These hold-down fingers can exert a hold-down pressure up to 1000 pounds per running inch . . ."**

the floor by a hydraulic motor. A retracting hydraulic cylinder on the hinged end then opens the table top. In closing, the table top lowers first and then the end gate folds up against it. Slightly tapered plugs on the end of the table top fit into slightly tapered female recesses in the end gate to center the table top exactly as it should be over the welding mandrel.

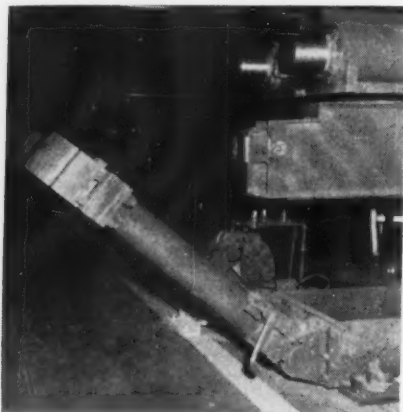
This opening feature, in addition to making it easy to unload huge cylindrical shapes from the machine, greatly facilitates changing of the heavy welding mandrels employed. With the top open, the mandrel to be changed is merely rolled out and the new mandrel is rolled in place.

A second innovation is the use of parallel floor rails on each side of the

welder, mounting casted material handling tables. The large sheets to be butt welded are placed on the tables on both sides of the machine and then the tables are shoved along the parallel rails until the sheets edges are in position on the welding mandrel. This arrangement vastly simplifies aligning heavy material in the machine.

According to Byron R. Russell, owner of the company, the new machine will butt weld material up to 1/2-inch in thickness, aligning it perfectly before the welding process starts. This alignment of the edges is accomplished by hold-down fingers along both sides of the mandrel. These hold down fingers, each approximately two inches wide and spaced continuously tight together throughout the length of the welding mandrel, can exert a hold-down pressure up to 1000 pounds per running inch, or 2000 pounds per lineal inch of the welding mandrel. This is said to be enough pressure to force even the most distorted material into critical alignment on the welding mandrel.

At the other extreme, the huge welder can weld cylinders as small as 10 inches in diameter by suspending them below rather than coiling them above the welding mandrel. Material as thin as 0.005 inch can be successfully butt welded. Of course, less hold-down pressure is exerted on the thin material. This lesser hold-down pressure is made possible by three banks of regulators in the control console so that three

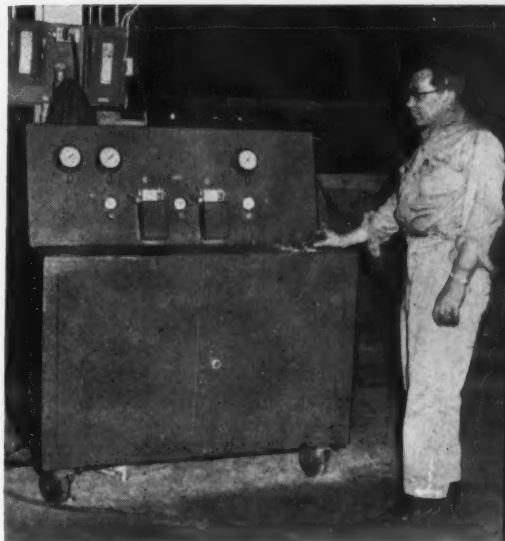


*End gate folds upward to meet the table during closing. Tapered plugs on table end fit into tapered female recesses in end gate to center table exactly over welding mandrel.*

distinct hold-down pressure maximums are available.

Construction of huge cylindrical tanks for a sugar refinery is a good example of what can be accomplished on this one large machine. To begin with, 60-inch by 144-inch sheets were welded side by side to produce 120-inch by 144-inch tank components. These large components were then welded together into a sheet measuring 10 feet wide and 47½ feet long. In the final weld, this huge sheet was curled overhead and the opposite ends brought together on the welding mandrel. The final weld was completed from the inside. The end gate of the welder was then dropped, the table top opened, and the huge cylinder was easily slipped out over the end of the table.

Mr. Russell points out that practically any type of automatic welding head can be mounted on the unit.



Control console. Table top is opened and closed from this console. Pressure on hold-down fingers is also adjusted from console.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

## Dimensional Air Gaging Film

**The fundamental principles of measuring dimensions with air pressure** and how these principles are used to obtain a high degree of gaging accuracy and reliability are described in a 16 mm. sound color film produced by Federal Products Corporation of Providence, Rhode Island. Titled "Dimensional Gaging with Air," the film, which has a running time of 42 minutes, shows actual tests to illustrate basic principles of air gaging while demonstrations show the practical applications and possibilities. Other scenes show how air gages are used in general machine shop gaging operations and

how they are applied to high-production multiple inspection, as well as in various types of machine control applications.

Of a technical nature, this film contains valuable information for the experienced engineer as well as for those in training. It discusses the various air gaging systems in common use, showing how each operates and where they best fit into the overall quality control and inspection programs.

"Dimensional Gaging with Air" is available on a free loan basis through the Sales Promotion & Advertising Department, Federal Products Corporation, 1144 Eddy Street, Providence 1, Rhode Island. Films must be returned by way of prepaid express.



# How to Make a Machine Index

***Machine indexing provides a guide to economy, for use of equipment and machines, commensurate with the size and capacity of your business.***

By GEORGE CLAYTON FIELD

In these days of increasing automation, various industrial establishments that are converting to tabulating systems are confronted with many problems. Beyond a mass of technical planning required to establish a system, there is the psychological problem of fear of unemployment as a result of its labor-saving qualities. This condition has existed in the minds of men since the age of invention began. When labor-saving machines are installed, savings are made and the cost of the product is reduced proportionately. Competition compels it. When automation introduces tabulating equipment, we not only save but we improve our technique as well.

Tabulating systems provide a capacity unattainable by ordinary processes of mathematics. It is a well known fact that tabulating provides us with a new tool but it requires men to direct and control it. To adopt a tabulating system, it is necessary to make methods and procedures compatible with its requirements. Such was the case when our machine index was converted to the tab system.

**Machine indexing is important for many reasons.** It provides a guide to economy, for use of equip-

ment and machines, which is commensurate with the size and capacity of your business. It provides a means of cost reduction that helps determine when and where new machines are needed to replace old ones. It also provides a means of identification for methods and operations that are used in conjunction with machines.

Machines have been indexed at our plant for more than 25 years. Prior to that time we merely specified machine names on the routing cards, (manufacturing order master cards) such as "1 Spdl Drill," "Punch Press," "Turret Lathe," and so on. After that, symbolic numbers were set up, using the first letter of the machine name in conjunction with numbers for further identification, in the following manner: "1 Spdl Drill" became D7; "Punch Press" became 4N, meaning No. 4 Niagara Punch Press; "Turret Lathe" became L6W, and so on. This was good for abbreviation when making time cards in the manufacturing departments, and for speedier typing, and lent itself better to transferring onto index cards for making an index file in the Routing Department. These symbolic machine numbers were adequate until automation and Integrated Data Processing obsoleted our methods.



# Compatible with Tab System

In 1957 we had made a new machine index using tabulating cards but retaining the symbolic line of machine numbers on the routing cards. This was done by making a cross reference card on which the machine numbers and the Tab numbers were shown. This made it possible to punch and use Tab cards for our machine index. This machine index reference card was made for each routing card.

In order to understand this well, the reader must know just what is meant by the term "Routing Card." The first purpose of a routing card is its function as a master plan sheet to provide manufacturing orders for the shop departments. The routing card is also used as a record of machines, tools, operations and measured hours per thousand pieces, needed for cost purposes. The routing card is a planning sheet to record the best possible methods of manufacture for future use on each part. Each routing card is identified by a part number and it shows the drawing number as well. A machine index leads us to ways and means to achieve cost reductions as well as efficiency of manufacture.

Since May of 1959 processes and procedures were established for the purpose of producing our entire routing card and its related data with tabulating equipment. In order to do this with caution, a pilot run is being conducted which starts with a deck of Tab cards from which the routing card is produced. This pilot run has produced 2,000 routing cards from

which unforeseen methods and procedures are being corrected. One of the major changes put into practice at this time was to change the entire list of machine numbers. This required a scientific numerical system that would be compatible with the Tab system. This really had to be done because the whole routing is being reproduced by key punched cards, all of which had to be coded. Following is a list of benefits that we expect to derive from the Tab routing system:

(A) This new system will use Tab decks to print all stock order routing card hectograph units from which routing cards and reference copies are reproduced. Orders for manufacture are to be reproduced from units made for that purpose from decks.

(B) Quantities of material are extended to conform to the quantity of the lot being ordered and requisitions are produced for the orders.

(C) Scheduling of stock orders is done mechanically.

(D) Machine loading. Each order issued to the manufacturing departments will be scheduled by tabulating equipment. The standard practice of scheduling, now performed manually, will be used in the machine computation. Many machines are now loaded manually by schedulers and the hours of load are recorded so that no machine is overloaded in a given period of time. The tabulating equipment will calculate the hours of load on each order and will be scheduled accordingly. When capacity is consumed on a given machine, in a given

## Machine Index . . .

## MACHINE INDEX PLANNING WORK SHEET

Department	Machine	Cal	Machine	Cal	Machine	Cal	Machine	Cal	Machine	Cal	Machine	Cal	Machine	Cal	Machine	Cal	Machine	Cal										
C1	20-0	11	22	45-5	17	11	35-5	20	45	70-7	24	32	61-0	26	58	47-5	33	18	76-3	50	21	36-7	91	27	53-7	94	74	63-7
C1	28-0	11	23	43-1	17	17	44-3	20	47	70-7	25	10	48-3	26	59	47-5	33	18	76-3	50	21	36-7	91	27	53-7	94	74	63-7
M2	22-1	11	26	45-3	17	18	44-1	20	50	70-7	25	11	48-3	27	11	48-3	33	20	76-3	50	23	36-9	91	31	53-7	94	76	63-7
C3	21-1	11	26	45-3	17	20	44-1	20	53	70-9	25	12	48-3	27	12	48-3	33	21	76-3	50	25	36-0	91	35	53-7	94	76	63-7
C4	27-3	11	30	42-0	17	22	44-5	20	55	70-9	25	12	48-3	27	12	48-3	33	22	76-3	50	25	36-0	91	35	53-7	94	76	63-7
C5	21-3	11	30	42-0	17	25	44-5	20	55	70-9	25	12	48-3	27	12	48-3	33	22	76-3	50	25	36-0	91	35	53-7	94	76	63-7
C6	22-0	11	31	45-5	17	25	44-5	20	55	70-9	25	12	48-3	27	12	48-3	33	22	76-3	50	25	36-0	91	35	53-7	94	76	63-7
C7	23-0	11	32	42-1	18	11	48-3	20	58	70-9	25	15	48-3	27	16	48-3	33	24	76-3	50	28	36-1	91	38	53-7	94	76	63-7
C7B	24-0	11	34	41-1	18	13	48-3	20	60	71-0	25	16	48-3	27	18	48-3	33	24	76-3	50	30	36-5	91	40	53-7	94	76	63-7
C7C	25-0	11	34	41-1	18	13	48-3	20	60	71-0	25	16	48-3	27	18	48-3	33	24	76-3	50	30	36-5	91	40	53-7	94	76	63-7
M3	24-1	11	35	41-1	19	12	47-5	20	61	71-0	25	16	48-3	27	18	48-3	33	24	76-3	50	30	36-5	91	40	53-7	94	76	63-7
M4	24-1	11	35	41-1	19	12	47-5	20	61	71-0	25	16	48-3	27	18	48-3	33	24	76-3	50	30	36-5	91	40	53-7	94	76	63-7
M5D	24-1	11	35	41-1	19	12	47-5	20	61	71-0	25	16	48-3	27	18	48-3	33	24	76-3	50	30	36-5	91	40	53-7	94	76	63-7
C10	27-1	11	38	41-7	19	14	47-5	21	12	74-1	25	26	72-1	29	14	65-0	34	12	57-0	52	11	48-5	93	84	47-7	97	29	86-1
C11	28-1	11	41	43-0	19	16	47-5	21	12	74-1	25	26	72-1	29	14	65-0	34	12	57-0	52	11	48-5	93	84	47-7	97	29	86-1
C12	26-0	11	42	41-0	19	17	47-1	21	13	74-1	25	26	72-1	29	14	65-0	34	12	57-0	52	11	48-5	93	84	47-7	97	29	86-1
C13	27-0	11	44	43-0	19	18	47-1	21	14	74-1	25	26	72-1	29	14	65-0	34	12	57-0	52	11	48-5	93	84	47-7	97	29	86-1
E14	29-0	11	51	42-1	19	19	47-3	21	15	75-1	26	11	64-1	29	16	64-7	34	16	58-0	54	11	77-3	93	48	62-1	98	10	83-0
E15	29-1	11	52	42-5	19	20	47-3	21	16	75-1	26	11	64-1	29	16	64-7	34	16	58-0	54	11	77-3	93	48	62-1	98	10	83-0
E15A	28-3	11	54	44-0	19	21	47-3	21	17	75-1	26	12	64-1	29	16	64-7	34	16	58-0	54	11	77-3	93	48	62-1	98	10	83-0
E16	28-3	11	54	44-0	19	21	47-3	21	17	75-1	26	12	64-1	29	16	64-7	34	16	58-0	54	11	77-3	93	48	62-1	98	10	83-0
E17	28-3	11	54	44-0	19	21	47-3	21	17	75-1	26	12	64-1	29	16	64-7	34	16	58-0	54	11	77-3	93	48	62-1	98	10	83-0
E18	30-1	11	61	41-7	19	24	35-0	21	21	75-0	26	15	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
C20	22-3	11	62	45-0	20	10	69-0	21	21	75-0	26	15	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
C21	22-3	11	63	40-9	20	10	69-0	21	22	75-0	26	16	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
S23	29-5	11	64	42-3	20	11	71-0	21	23	75-0	26	16	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
N37	23-3	11	76	45-1	20	13	37-1	21	25	74-0	26	16	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
N40	30-0	11	81	45-1	20	14	35-3	21	26	74-0	26	16	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
C43	25-3	11	86	40-5	20	14	35-3	21	26	74-0	26	16	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
E46	26-3	11	86	40-5	20	14	35-3	21	26	74-0	26	16	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
C130	27-3	12	11	41-7	19	24	35-0	21	21	75-0	26	15	62-5	29	27	65-1	34	22	54-0	55	14	51-1	93	59	58-7	99	13	57-9
Formet	31-0	12	12	59-9	20	18	69-3	23	21	38-7	26	18	68-3	29	20	65-0	34	24	55-0	58	10	48-5	94	37	63-7	94	74	63-7
Formet	31-1	12	12	59-9	20	18	69-3	23	21	38-7	26	18	68-3	29	20	65-0	34	24	55-0	58	10	48-5	94	37	63-7	94	74	63-7
Non-Pe	31-3	12	15	59-5	20	19	69-3	23	22	38-7	26	18	68-3	29	20	65-0	34	24	55-0	58	10	48-5	94	37	63-7	94	74	63-7
Bar	32-1	12	19	59-7	20	20	70-3	24	20	69-1	26	19	68-3	29	21	65-1	34	24	55-0	58	10	48-5	94	37	63-7	94	74	63-7
Cxig	32-2	12	20	44-1	20	22	69-1	24	21	61-1	26	31	63-3	31	11	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
Mold	32-5	12	25	59-0	20	23	71-1	24	22	61-1	26	32	62-3	31	12	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
(Non-Met)	32-5	12	25	59-0	20	23	71-1	24	22	61-1	26	32	62-3	31	12	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
Tube	33-0	12	29	59-3	20	24	71-1	24	23	61-1	26	34	62-3	31	12	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
Pell	33-1	12	31	60-1	20	26	71-7	24	24	61-3	26	34	62-3	31	12	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
Wire	33-5	13	16	38-7	20	29	70-3	24	24	61-3	26	34	62-3	31	12	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
Misc. R.M.	33-5	13	16	38-7	20	29	70-3	24	24	61-3	26	34	62-3	31	12	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
Shape	32-0	14	10	35-0	20	31	70-0	24	24	61-3	26	34	62-3	31	12	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
Porta	34-0	14	11	35-0	20	32	39-3	24	22	61-5	26	42	68-5	31	12	44-0	43	10	47-3	90	54	48-0	94	41	64-0	94	74	63-7
Machines	34-0	14	13	35-1	20	33	69-5	24	23	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-0	14	15	35-0	20	34	75-0	24	24	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-3	14	15	35-0	20	34	75-0	24	24	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-5	14	15	35-0	20	34	75-0	24	24	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-5	14	15	35-0	20	34	75-0	24	24	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-5	14	15	35-0	20	34	75-0	24	24	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-5	14	15	35-0	20	34	75-0	24	24	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-5	14	15	35-0	20	34	75-0	24	24	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-5	14	15	35-0	20	34	75-0	24	24	61-5	26	44	68-7	31	10	74-3	50	12	38-3	91	56	77-1	95	43	73-0	95	43	73-0
11	41-5	14	15																									

## ADDED MACH GROUPS

[illegible]

May, 1960

## MODERN MACHINE SHOP

143

**Fig. 2—Example of old Machine Index Planning Work Sheet.**

Department	T date	ID	70-1	A13N	52-7	C-3	D-40A	45-5	G11A	65-0	H125	88-7	M6	61-3	R31	35-3	S38	07-9	T135	88-3	W31B	71-7
C1 H3M	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
AS2M	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	32-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
C1 H3M	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
C1 H3M	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
C1 H3M	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
C1 H3M	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
C1 H3M	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32	73-1	S39	70-7	T150	88-5	W51L	71-7
	28-0	33-1	76-1	A13N	86-0	35-5	D41	41-5	G13N	67-1	H150	87-5	M10	40-0	R32							

**"... each week open orders will be up-dated ..."**

period, the order will be scheduled into the next period. Each week, the shop departments will be given tabulated reports of orders scheduled on loaded machines, by machine index numbers. Therefore, each week open orders will be up-dated on the machine load schedule report, closed orders removed and future orders relocated in order of schedule. This is one of the most important aspects of the tabulating of machine functions and the most important area of numbering compatibility.

(E) Move tickets are preprinted for the purpose of moving material in process from one department to another.

(F) Time cards are to be prepared for each operation for use by the manufacturing departments.

(G) Advance tool notification cards are produced.

(H) Tool usage and maintenance cost reports are to be made.

(J) The input record is computed for the stores department to be thus kept informed of the amount of work in process.

(K) Cost accounting, for parts manufactured, is done with mechanized equipment.

(L) Cost deviation reports are to be extracted.

Because our present routing form was not suitable for tabulating machine purposes, a new form was designed that was compatible for both tabulating machine printing and manual typing. We now are using the new form in these two ways. The 2000 card pilot run for the Punch Press Department is now converted to the Tab system and produces the

hectograph units, for orders and routing cards, from Tab decks. In preparation for a complete conversion, our typists are now producing these hectograph units on the new form so that when it is decided to convert the entire stock routing file to Tab, we can proceed to punch Tab cards for Tab decks, using the new routing forms that have been made ready.

**Conforming to the new system,** the new machine index was designed to work in the following manner: The basic numbers are the first two digits which indicate specific functions such as drilling, milling, or punch press work. For example, we will take the number 1130. The first two digits are 11 and they designate the function of drilling. The last two digits, 30, qualify it more specifically by defining that it is a 1-spindle drill press. So the number 1130 is the complete machine number identification.

Following this practice, the first two digits identify various functions in the following manner: For instance, 10 indicates bench operation; 12 is heat treating; 24 is milling; 26 is hydraulic press work, and so on. The last two digits of the four digit number, more specifically, identify the machine characteristics. When the new numbers appear on the routing, a decimal point appears between the second and third digit. The decimal point is for tabulating purposes and should be disregarded for identifying purposes.

In order for the routing planners to apply the new machine index to the routing card, it was necessary to compile a cross reference list of

machine numbers for them. The functional 2-digit numbers were listed first, giving the name of each function such as drilling, milling, and so on. Then a complete list of the 4-digit numbers was given showing the old machine number beside each one and the name of the function and complete and specific characteristics. While there are about 90 of the basic numbers available for machine work functions, we have only used 52 of them to set up the system. Each one of these numbers can use a possible 90 modifications or specific identifications to make a total 8100 possible machine numbers that can be indexed thusly.

**Our first tabulated machine index** was made by making one Tab card for each of 32,000 routing cards for stocked parts. To gain a comprehensive view of this system, the reader should refer to the illustrations

[illegible]

**Fig. 3—Example of routing card which functions primarily as master plan sheet to provide manufacturing orders for shop departments.**





MANUFACTURING ORDER & ROUTING

**Fig. 5—Exhibit of routing produced with tabulating equipment on old form.**

**"The first requirement was to index the machines . . ."**

that show the old and the new Machine Index Planning Work Sheets. The main difference is the list of new machine numbers in place of the old incompatible machine numbers. The new sheet is shown in Fig. 1 and the old work sheet in Fig. 2. It will require three or four years to convert existing routing cards to the new system and its compatible machine index.

When we first established the tabulated machine index, it was necessary to keep within the limits of the Tab card capacities. We wanted to be able to retain as much information as possible from the data punched on the machine index Tab card. The first requirement was to index the machines and then the departments in which the machines were used. The classes of material, shapes and kinds were also included. The present, new Machine Index Planning Work Sheet shown in Fig. 1 has 32 department numbers, 10 kinds of material and 450 machines. Within the 10 columns of numbers there is still room for expansion.

The machine numbers that classify and identify each machine are shown at the left of each column and the Tab code number is to the right of each machine index number.

**The Machine Index Planning Work Sheet** helps the manufacturing planners make corrections and maintain the routing and Tab cards. When a correction is made, a new Tab card is marked by the planner and is key punched accordingly. When the compatible system is completely established, the corrections will be relayed to the key punch operator by a corrected copy of the routing being changed, and the index Tab card system will be taken care of along with other routing changes being made.

Various combinations can be sorted that will furnish an infinite number of possible sources of information for cost reduction and general efficiency. This becomes the pulse of the whole production system and gives control and utility which before were possible only through manual methods, if such methods existed at all.

★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★ ★

**Automating the Manufacturing Process.** By George F. Hawley. Published by Reinhold Publishing Corp., 430 Park Ave., New York 22, N. Y. 147 pages. Illustrated. Cloth binding, board covers. Price, \$4.95.

This book helps management and production personnel gain a greater appreciation of the risks encountered in successful automation, while designers and development engineers will find ideas which should mini-

mize their failures. The author presents in practical terms some of the mechanical problems involved in inventing and designing machinery for specific operations, such as assembly of components, packaging of individual products, bottle capping, feeding, and so on. He also spells out some of the pitfalls involved in automation and discusses in detail the roles of the inventor, design engineer and the production planner.

# LENOX ANNOUNCES MAJOR BAND SAW BLADE ADVANCEMENT!

*The Lenox Master-Band triples the square inches of cutting per blade. Its positive cutting life is guaranteed to be at least three times longer than regular bands. A faster cutting rate is immediately visible. New cutting accomplishments can be made with standard band saw machine equipment. SEE COUPON BELOW for Guaranteed Trial Offer.*

**WE GUARANTEE** that the new Lenox MASTER-BAND will definitely put new life and more versatility into your standard band saw machine. Master-Band will cut 50% faster . . . cut more square inches of metal . . . cut many of the tougher alloy steels on standard equipment . . . and we guarantee Master-Band will outlast at least **THREE** regular metal cutting bands.



**THE MASTER-BAND IS SUPERIOR!** The special steel analysis of Master-Band results in a

greater quantity of carbides in the structure. Processed through the Lenox modern, skillful heat-treating, Master-Band assures superior wear resistance, highly extended fatigue resistance, and continuous cutting of tougher steels at faster rates.

The Lenox TRUE-WELD process—using specifically designed equipment in welding Master-Band—guarantees the almost total elimination of weld breakage. Each blade is perfectly matched, electrically butt welded, and inspected to assure integrated bonding. Each weld is precision ground and inspected to prevent hollowing.

**COST ADVANTAGES** include: faster rate of cutting; less costly down-time; cutting tougher steels on standard equipment.

**GUARANTEED TRIAL OFFER.** Prove to yourself that the new MASTER-BAND modernizes your cutting operation and decreases costs. Fill out the coupon below and mail today. Or see your industrial distributor.



**AMERICAN SAW & MFG. CO.**  
SPRINGFIELD, MASSACHUSETTS, U. S. A.

PLEASE FURNISH ALL INFORMATION REQUESTED.

COMPANY..... (type or print)

ADDRESS..... (street & no.)

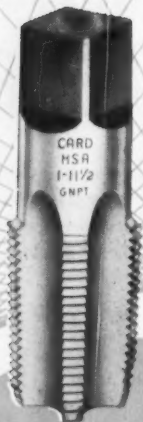
city..... state.....

IMPORTANT! PLEASE COMPLETE  
MATERIALS AND SIZES CUT MOST.....

MAKE AND MODEL MACHINE.....

INDUSTRIAL DISTRIBUTOR.....

For more data circle 418 on Postpaid Card



## CALCULATED TO CUT COSTS

A truly geometric pattern is followed in precisely duplicating each CARD tap, according to type and size. For high volume, high quality production, specify CARD taps. Your CARD Distributor can make fast deliveries of the taps, dies, gages and screw plates you need. For helpful advice on their selection and use, call in your CARD technical man. S. W. CARD DIVISION, Mansfield, Mass. Card Warehouses: Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco.

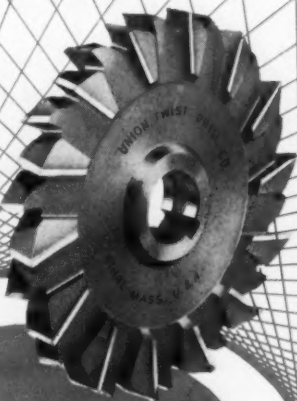


# CARD

**DIVISION OF UNION TWIST DRILL COMPANY**

*Serving you through the best distributors from coast to coast*

**For more data circle 419 on Postpaid Card**



GEOMETRY: PROGRESSION SYMBOLIZES PRECISE DUPLICATION

## CALCULATED TO CUT COSTS

Every UNION cutting tool is duplicated with geometric precision, in each type and size. To your own plant this exact duplication of UNION inserted blade cutters brings most dependable performance, longest service life. Make sure you get these advantages. Specify UNION inserted blade cutters, drills, reamers, milling cutters, end mills, gear cutters, hobs, and carbide tools. Available nationally through UNION Distributors and stocked in UNION warehouses in Atlanta, Chicago, Detroit, Fort Worth, Los Angeles, New York City, and San Francisco.



# UNION

UNION TWIST DRILL COMPANY, Athol, Massachusetts  
S. W. Card Division, Mansfield, Mass. Butterfield Division, Derby Line, Vt.

For more data circle 420 on Postpaid Card

## HYDRAULIC PRESSURE AIDS

# Precision Tube



*A large diameter stainless steel tube after precision bending with the aid of hydraulic pressure. The diameter tolerance through the bend is plus-or-minus zero when compared to the unbent diameter.*

**Unusual process assures  
high precision bends  
with minimum rejects.**

By H. W. BRADSTREET

Facilities Engineer, Long Beach, California Division,  
Douglas Aircraft Company

**Hydraulic oil under pressure is being used to supplement a flexible mandrel** in precision bending of stainless steel tubing for installation in the huge, new Douglas DC-8 jet transport airplane at the Long Beach, California Division of Douglas Aircraft Company. Tubing up to 5½ inches in diameter is being successfully precision bent with the aid of this pressure medium. The hydraulic oil is used to supplement the flexible mandrel on all bends of 15 degrees or more and down to bends with a 2D radius (radius of bend equal to twice the diameter of the tubing).

Most important, by using this pressure medium to aid the flexible mandrel in keeping the tube walls from collapsing through the bend area, tube diameter throughout the bend has a plus-or-minus 0 tolerance when compared to the diameter of the unbent portions of the tube.

The setup for this work is relatively simple. Two unused hydraulic test benches, each with a motor and pump, were modified to furnish hydraulic oil at pressures ranging

upward to 350 p.s.i. Each of these modified pressure accumulators services two Pines tube benders. Actually, because the tube benders were not modified in any way, either one of the pressure accumulators can service any one of the four tube benders now in use.

A series of 4-segment expanding steel plugs with either circular or flat O-rings was designed to plug the open end of tubes of different diameters while they are being bent. A high pressure rubber hose from the accumulator pump leads through this plug to admit the pressurized hydraulic oil during bending. The same tube receives the backflow of oil after the bend has been completed. A second hose through the plug admits compressed air to aid in expelling the hydraulic oil from the tube after the bend.

Prior to bending, each tube is beaded circumferentially adjacent to the end in which the expanding plug will be inserted. A male bead on the plug segments fits into this tube bead when the plug is inserted and expanded. A steel collar, open on one side



# Bending

and hinged on the other and provided with a circumferential female bead on its interior surface, is then clamped around the exterior tube bead to prevent the expanding plug from actually enlarging the tube end diameter and to give added strength to the plug connection.

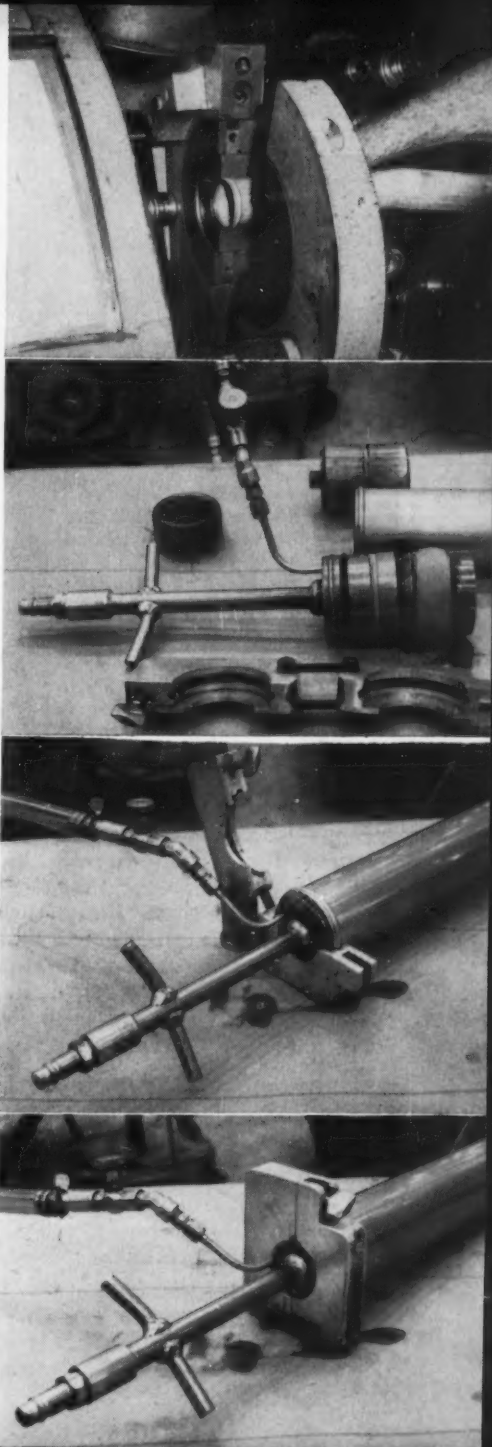
With the setup completed and with both the plug and flexible bending mandrel in place, hydraulic oil is admitted at pressures ranging up to 350 p.s.i. (dependent upon tube size and wall thickness) into the tubing space between the plug and the flexible mandrel. The flexible mandrel itself effectively seals the opposite end of the tube against any leakage. As bending proceeds and the mandrel moves away from the plug, the expanding space is kept filled with

(TOP) Beading a tube end prior to bending. Bead helps hold both plug and steel restriction collar in place. The bead is trimmed away after bending operation is performed.

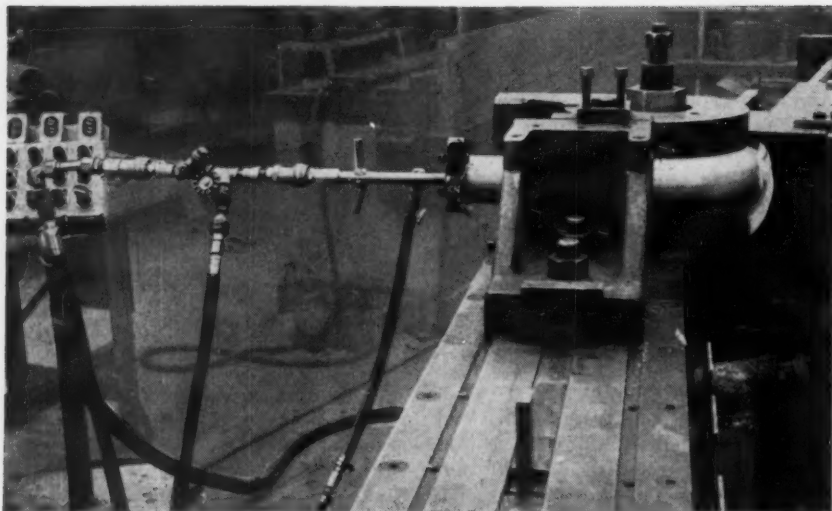
(SECOND DOWN) Elements employed in hydraulic pressure bending. Bottom—steel restriction collar which fits around tube bead and keeps tube from being expanded by plug. Just above collar—the four-segment expandable plug with rubber O-rings. Plug segments expand along with the heavy rubber ring at right end which is crushed into expansion between the heavy plug bushings that are forced together when plug is expanded.

(THIRD DOWN) Here the plug has been placed in the tube end, but is as yet unexpanded.

(BOTTOM) The steel collar is closed and fastened as shown, then plug is expanded.



## Precision Tube Bending . . .



*In actual bending, the flexible high-pressure hoses connected to the plug have sufficient slack so that they can sweep around with*

*the tube end. Note both hydraulic and air hoses make connections to the plug. Air is to expell hydraulic oil after bending.*

hydraulic oil at the desired pressure. When the bend is completed, the accumulator pressure is cut off, and compressed air is blown into the space between the plug and the mandrel to push the hydraulic oil back through the plug and rubber hose into its original container. The steel collar and plug is then removed, and the bent tube is removed from the Pines tube bender. Of course, the

beaded end portion, for which approximately one inch in length must be allowed, is then trimmed away.

As already pointed out, stainless steel tubing up to 5½ inches in diameter is being successfully precision bent by this technique. Standardized increments in tubing diameters up to 5½ inches are being bent both to minimize the number of machined steel bending blocks requir-



*This illustration provides another view of the plug elements, along with the flexible mandrel which is employed to plug the opposite end of the tube that is being bent.*



# Nicholson Announces

HIGH  
SPEED  
STEEL BAND  
SAW BLADES

Now after extensive research, we have developed a High Speed Steel Band Saw blade worthy of our respected trademark. It's an extra long wearing blade for high speed production. It's now offered by selected Industrial Distributors. Ask your distributor salesman about it.

\* Our products are sold exclusively through Industrial Distributors. They offer the finest goods and services in the least possible time.

For more data circle 421 on Postpaid Card

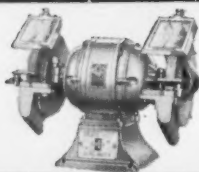
  
**NICHOLSON**



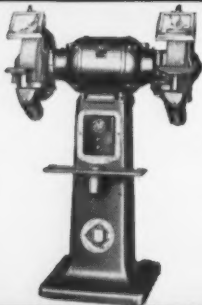
Nicholson File Company,  
Providence 1, Rhode Island

Files • Rotary Burs  
Hacksaw and Band Saw Blades  
Ground Flat Stock  
Industrial Hammers

# BUY the BEST



# for LESS!



## Queen City

### GRINDERS & BUFFERS

Your first savings . . . when you buy QUEEN CITY Grinders and Buffers . . . is only the start! You save 20 to 30% . . . get extra heavy spindles, extra duty ball bearings, special motors . . . extra long, low-cost service. Prove it with 30-Day Trial Offer! Complete range of floor and bench types, from 1/2 to 10 H.P.

Write today for Free Catalog

**QUEEN CITY  
MACHINE TOOL CO.**

3911 Kellogg Ave.  
Cincinnati 26, Ohio

"High Quality—Low  
Cost—For Over 50 Years"

For more data circle 422 on Postpaid Card

### Precision Tube Bending . . .

ed and also to minimize the number of expanding plugs needed. Standard stainless steel tubing wall thicknesses of 0.016, 0.020, 0.025, 0.028, and 0.032 inch are generally used for the work at hand.

The efficiency of using pressurized hydraulic oil to aid the flexible mandrel in tube bending is best illustrated by the fact that bend rejects run less than 2 percent, and of those few rejects that do occur, most of them can be traced to operator error.

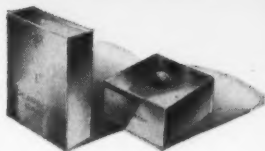
★ modern machine shop ★

### Gas Shielded-Arc Welding.

The first AWS book on Gas Shielded-Arc Welding Processes has been announced by the American Welding Society. Containing 78 pages, 39 illustrations and 9 tables, the book describes in detail the group of processes which originally went under the name of Inert-Gas Processes. The development of shielding gases, such as CO<sub>2</sub>, which are not inert, caused the change of name.

The contents are taken from published and unpublished material from Sections I, II and III of the Fourth Edition of the Welding Handbook. Included in this small, authoritative book are data on: Gas Shielded Tungsten-Arc Welding, Gas Shielded Metal-Arc Welding (including CO<sub>2</sub> Welding), Cutting, Gases, Equipment, and Cost Data. The book is profusely illustrated with photographs, schematic diagrams and charts. Copies may be obtained at a price of \$1.50 each from the American Welding Society, 33 West 39th Street, New York 18, New York.

## Accuracy, Stability, Wear Life

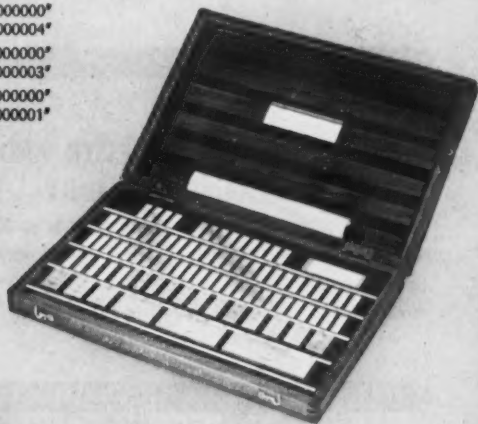


These are qualities to look for in gage blocks—qualities you'll find finest by far in Ellstrom Chromium Plated Standards. Size, flatness, parallelism unconditionally guaranteed to closer specified millionths than any other blocks you can buy. Made only of time-tested materials fully certified for uniform hardness, absolute metallurgical stability. And gaging surfaces chromium plated by an exclusive Ellstrom process to give you longer wearing millionths, lower gaging costs. Next time you buy gage blocks, be sure you get the very best—be sure to specify

## ELLSTROM CHROMIUM PLATED GAGE BLOCKS

MANUFACTURED AND CALIBRATED TO THE INTERNATIONAL INCH—EXACTLY EQUAL TO 25.4 MILLIMETERS

- "W" Working Accuracy:  $\pm .000008''$  /  $-.000000''$   
Parallelism:  $.000004''$  / Flatness:  $.000004''$   
"I" Inspection Accuracy:  $\pm .000004''$  /  $-.000000''$   
Parallelism:  $.000003''$  / Flatness:  $.000003''$   
"L" Laboratory Accuracy:  $\pm .000002''$  /  $-.000000''$   
Parallelism:  $.000001''$  / Flatness:  $.000001''$



Above: Ellstrom Rectangular Set No. 85-R. Left: Ellstrom Square Set No. 81-SA, with accessories.

New Catalog contains prices and specifications—send for it today!

### ELLSTROM STANDARDS DIVISION DEARBORN GAGE COMPANY

Originators of Chromium Plated Gage Blocks



22038 Beech Street • Dearborn, Michigan



#### \*Ellstrom—Measuring in millionths for three generations

Hjalmar Ellstrom (1863-1942)—He gave mankind the key to mass production of interchangeable parts. For it was he alone who conceived and produced the world's first combination gage blocks—the first master reference standards accurate to the infinitesimal millionth part of an inch!

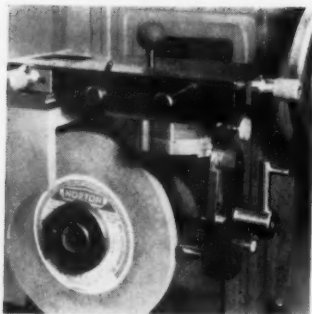
For more data circle 423 on Postpaid Card



You get day - in  
with J & S

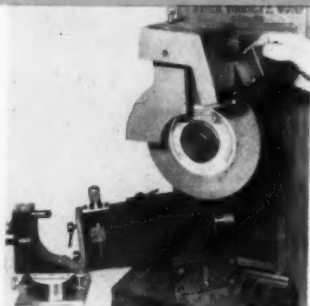
### **"FLUIDMOTION" WHEEL GUARD DRESSER**

meets modern grinding equipment demands. Spring loaded pin in the feed mechanism permits the dresser to be easily removed after the dressing operation.



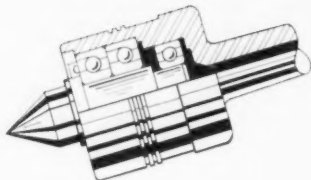
### **STRAIGHT DIAMOND DRESSER AND CORNER CHAMFERING UNIT**

A new unit interchangeable on J & S Wheel Guard, will dress the periphery of the wheel. More positive, rapid operation with minimum equipment.



### **H TYPE LIVE CENTER, HEAVY DUTY**

for lathes and turret lathes, meets requirements for heavier feeds and high speeds. Tandem flush ground bearings for greater capacity.





# day - out economy precision - crafted products

## **New J & S "Fluidmotion" Wheel Guard Dresser**

A unique advance in the grinding field, it is adaptable to quills of 3" to 3 1/2" diameter and includes an inverted base with compound micrometer lead screws for maintaining position of formed grinding wheel in relation to the work. Adaptable to 7" or 8" wheels, it may also be used with Model "F" Fluidmotion Wheel Dresser on 7" wheels. Available for most surface grinders.

## **Straight Diamond Dresser and Corner Chamfering Unit**

Engineered by J & S in conjunction and interchangeable with the Wheel Guard Dresser. Diamond block with the diamond protruding from the corner will dress the periphery of the wheel by means of an adjustment screw which minutely exposes the wheel at a 45° angle through the guide, making it possible to break corners with a single pass. Available as complete set with J & S "Fluidmotion" Wheel Guard Dresser or with the J & S Wheel Guard.

## **Complete Line of Precision-Built Live Centers**

Featuring one-year guarantee, self-adjusting bearing take-up, RPM speeds to meet capacity of modern machines, correct capacity ratings, hardened and ground throughout. Plus expansion compensators and divided thrust for maximum load.

*Literature and data on request*

**J&S TOOL CO., INC.**

871 DORSA AVE., LIVINGSTON, N. J.  
WYman 2-3181

For more data circle 424 on Postpaid Card



## Guest Editorial

**A crucial year begins our  
most crucial decade.**

By **ALFRED M. COOPER**  
Contributing Editor, Modern Machine Shop

**Politicians always refer to an election year, and particularly a Presidential election year, as "crucial." To them "crucial" usually means retaining or regaining office for themselves or elective officials within their party.**

But this year of 1960, and the decade to follow, may be regarded as crucial for Americans in more vital respects than those pertaining to partisan politics. More and more thinking production executives are expressing themselves as deeply concerned with factors which influence the future not only of the partisan politician but the continued existence of this country of ours as a free nation.

Because a majority of these factors deal with overall policies of industrial management, and the actions and beliefs of its supervisory force and work force, the belief is crystalizing that the most far-reaching decisions during this decade may not be made at the polls, but rather within the consciousness of the management and workers who go to make up private industry.

To anyone who has made even a casual study of our existing political and economic situation, domestic and

international, the smug complacency of many politicians, of certain among our educators and workers, of our army of governmental employees, and of the greater section of our press, is appalling. It would appear that from a number of sources we are being fed a species of pacifying pap that bears no faintest resemblance to reality.

*Thus, the worker has it hammered into him that he must, at all costs, own a bigger and better home, drive the latest model car, set up a beautiful backyard barbecue, and if possible provide his family with a swimming pool at least as large as that of his neighbors.* It would appear that we are celebrating a period of permanent national prosperity that has not yet arrived, and which, in the direction we are now travelling, never can arrive.

**This premature but inspired propaganda** manifests itself at a time when our national prosperity, and indeed our continuance as a great industrial democracy, faces a more serious hazard than at any time since 1930. It is inconceivable that those who are responsible for this steady flow of soothing, misleading publicity are not aware that America

is closer to becoming a second-rate power than at any time since the year 1900.

Even those publicists who feel impelled to warn us of our very real danger, for some reason put on the brakes just short of giving us the facts we must have if we are going to avoid following England down the trail to a future in which we surrender our liberties to those who control a Welfare State. (Perhaps England had no choice in this matter, *but we have.*)

Thus, the editorial writer for one of our soundest American mass-readership weeklies, devotes all of his space to a discussion of what inflation can do to us, but in passing only mentions that we must cut down our "public spending" as one remedy. This term is so vague that it has little meaning to the average citizen today. If he had stated that we cannot cut down much on our spending for defense, but had particularized as to where we *can* cut down on public spending, the editorial would have been of more value to the reader.

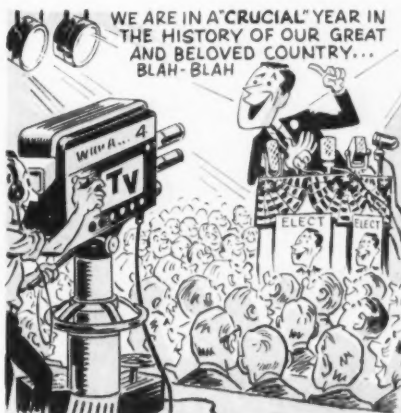
**Every President we have had since 1930**, and every nominee for either the presidency or a governorship, has promised faithfully during campaigns to lop off *surplus, unwanted* federal and state jobs totaling in the aggregate several million. Every man who has supervised as many governmental employees as I have knows full well that *one out of three of these people could be removed from the government payroll (federal and state) without in any degree impairing the useful functions of government.*

Yet no President, and but few governors, have succeeded in carry-

ing out these campaign promises for a period as long as two months after election.

As we all know, at the end of each four-year period there are more people working for government at the federal, state, county, and municipal levels than ever before. In directing supervisory discussions with foremen and office managers in governmental groups I soon hear the perpetual complaint of these bosses that "It takes three employees to do the work of two in this outfit." And the longer you work for government the more you become aware of the truth in this assertion.

The fault here does not lie with these supervisors, most of whom have had sufficient experience in private industry to know what constitutes a fair day's work and would like to make a better showing in their departments, even though these are designed to render service rather than to produce anything. There are, however, a number of individuals and



"To them, 'crucial' usually means retaining or regaining office for themselves or for elective officials within their party."

**"President has the power to limit number of employees."**

agencies that are definitely responsible for this condition of fantastic over-staffing of governmental bureaus.

To begin with, any President or governor has the power to limit the number of employees on the federal or state payrolls. He can do this in two ways: by putting pressure on bureau chiefs to cut their payrolls to the bone and thereafter require every governmental employee to put out a real day's work. Secondly, the most important authority in the mind of any governmental employee is that group of five men who make up the particular civil service commission which employs him. This group is appointed by an elected official, therefore their viewpoint is bound to be political. They have but one function and that is to carry out the orders of the man who appointed them—and who can dismiss them at



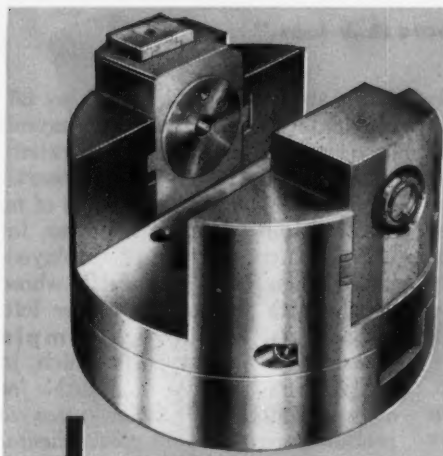
"... one out of three of these people could be removed from government payroll without impairing the function of the government."

will. Therefore, even slight pressure on any of the hundreds of civil service commissions by elected officials will result in an amazing decrease in the public payroll, and do this without in any way interfering with the proper functioning of the departments involved.

**It would be stupid** to expect the employees themselves to do much about reducing their numbers. It is also true that some of these employees have extremely advanced socialistic and internationalistic views on matters pertaining to governmental employment. They have come to accept as gospel the mouthings of the Marxists, and honestly believe that the entire country will soon be socialized, with the public employee exercising the same broad powers that have been accorded to bureaucracies in a country which has become socialized. It would be amazing if



"... the worker has it hammered into him that he must own a bigger and better home, drive the latest model car, provide a pool..."



another major  
chuck  
development  
from  
**SKINNER**

*A heavy-duty power chuck with jaws that freely index under full pressure. Indexing is simple, easy, and fast. The operator can index manually without touching the work or releasing the pressure. Jaws can be indexed by means of a lock screw and slide plate. The size and shape of the indexing pin is designed to fit firmly and positively into the indexing plate so that extreme accuracy of indexing is assured.*

One or both jaws can be furnished with indexing mechanisms. As a result, you can index more positions and smaller index angles. There is no need to buy a new chuck of different indexing positions because index jaws or index components can be interchanged quickly and easily.

This new Skinner chuck is available in body diameters from 12" through 36" and in all intermediate diameters.

FOR MORE INFORMATION about this and other major chuck developments, contact your Skinner Representative listed in the Yellow Pages or write us at Dept. 175.



THE CREST OF QUALITY

# SKINNERCHUCKS

THE SKINNER CHUCK COMPANY • NEW BRITAIN, CONNECTICUT  
For more data circle 425 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 163

**"... the effect will be to perpetuate their jobs."**

this worker did not feel thus. In addition to the radical politicians who preach this proposition daily, year in and year out, there are 3500 paid press agents in our federal government agencies alone who must pound on more and more employment in government. In addition, there are hundreds of "representatives" of state teacher groups who are, in reality, lobbyists in the state legislatures and Congress at Washington.

**The governmental workers in the United States**, at all levels, are the finest politically organized group in the world. I have, on various occasions, written of my experiences (in Nation's Business, Barrons, and U. S. News & World Report) as a trainer of 10,000 such employees in political activity. This duty came as an extracurricular activity in my work as educational director. No political-action organization in private industry can approach the zeal with which any group of governmental employees will get out and hustle votes. And to these dedicated people it is only necessary to tell them to fight for any proposition or candidate. They never question such an order; they know the effect will be to perpetuate their jobs.

And therein, of course, lies the secret of the failure of our elected officials to cut down on the size of the public payroll. *The candidate who makes the proper appeal to public employees is almost certain of election and re-election.* In my state, for example, a governor essayed to cut the state payroll. He was at once waited upon by a deputation representing the governmental employees

of his state, who told him to lay off. He laid off, and the state payroll increased during his administration. Unfortunately, even this subservience to the public workers was of no avail to him when he later ran for U.S. Senator, since these employees had by then found a candidate whose beliefs were yet farther to the left.

**There is, I believe, a simple remedy** for the situation which, in recent years *has made it advisable for all candidates for public office to promise payroll cuts in governmental bureaus, federal and state, while privately assuring the public employee he is only joking.* In this manner he has penalized all other citizens, particularly those employed in private industry who must pay increased taxes to support the added governmental workers.

That is, why should not the candidate promise everything under the sun to the bureaucrats until he has



**"The candidate who makes the proper appeal to public employees is certain of election."**





## A PRODUCT OF SKILL

**the complete line** Reamers are typical of Butterfield's long-life cutting tools. Also ready for fast delivery are: drills, taps, dies, counterbores, cutters, end mills, hobs and carbide tools. Phone for tools or technical assistance. Warehouses in Chicago, Detroit, Fort Worth, Los Angeles, New York and San Francisco.

**Call your Butterfield Distributor.**

# BUTTERFIELD

DIVISION, Union Twist Drill Company, Derby Line, Vt.

For more data circle 426 on Postpaid Card

**"The employee in industry should oppose socialization."**



"... all candidates promise payroll cuts in governmental bureaus while privately assuring the public employee he is only joking."

been elected, and then give these public employees the same double-cross he has been giving to the workers in private industry? That may not sound very pretty, but anyone who has been around politicians for any length of time would consider it "practical politics." In any event, the candidate would then only be double-crossing a minority of his supporters, and he certainly would be enabled to cut taxes right across the board.

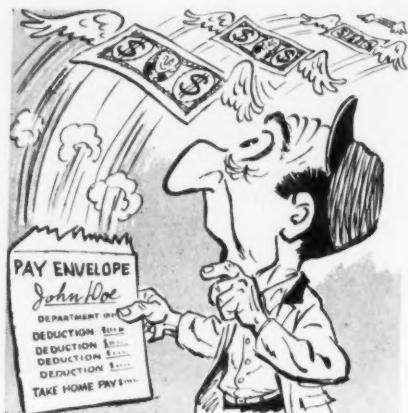
As to which among the Presidential candidates of 1960 might have the courage and integrity to thus carry out his public campaign promises, your guess is as good as mine. Regardless of how I voted in the past, one thing is certain, the candidate who can and who may really cut the public payroll by one-third, if elected, will get my vote.

Anyone who wished to see the first really important step taken in the

direction of putting a stop to inflation and the deadly trend toward socialization of all our industries would vote with me. The problem, of course, will be to guess which among the candidates possess such integrity.

In England nowadays, party labels mean nothing. If the Conservatives promise more handouts than the Laborites they win. That is one reason why the British are carrying ration cards after 21 years of bureaucratic regimentation. About the only people over there who do not have to "queue" daily for the necessities of life are the governmental employees who can afford to buy in the black market because they have the spending of England's minimum 50 percent income tax revenue, as well as her confiscatory death duties.

**The employee in private industry** should be the first to oppose socialization of our industries. Those



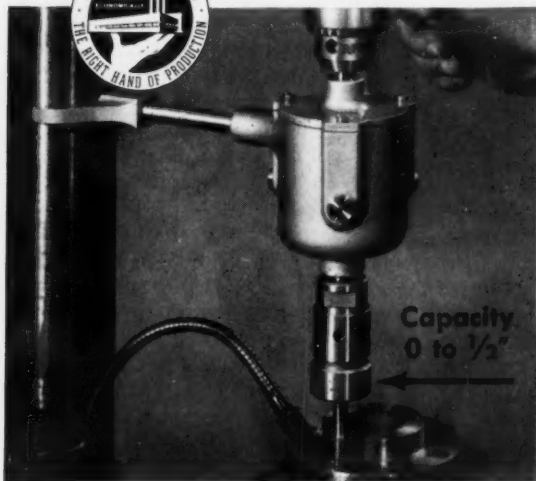
"... those something-for-nothing handouts from the government are paid for most dearly by those employed in private enterprise."

# New!

FOR THE FIRST TIME ...

## 0-1/2" CAPACITY TAPPING HEAD

FOR JUST \$63



### Check VersaTAPPER Features:—

- Capacity 0-1/2"
- Comes complete with tap chuck
- Ball bearing spindle
- Runs in oil
- Fits any drill press
- Fully guaranteed
- Installs in seconds

## Supreme VersaTAPPER

### DRILL PRESS TAPPING ATTACHMENT

The new Supreme VersaTAPPER gives tremendous tapping versatility—at a price that is no higher than some hand tapping devices. VersaTAPPER's capacity range is from 0 to 1/2". VersaTAPPER fits any drill press. It can be installed or removed in seconds. Why not circle

number on reply card and get full information on the VersaTAPPER. Available in two models:—No. 6100, with straight shank for chucking; No. 6200 with No. 2 Morse Taper Arbor for direct installation to drill press spindle. Each model—\$63.00.

From the makers of SUPREME BRAND CHUCKS

**SUPREME PRODUCTS CORPORATION**  
2222 S. Calumet Avenue, Chicago 16, Illinois  
DIV. OF A-S-R PRODUCTS CORPORATION

For more data circle 427 on Postpaid Card

**"... this republic would probably endure 200 years."**

who work for public utility corporations appreciate that it is stupid to pay 40 billion dollars for public power and then pay bigger electric bills than ever. There is no instance in which private enterprise cannot furnish any product or service more reasonable in price than socialized industry. In the case of the power companies, they would have built that 40-billion-dollar public power system for perhaps 30 billion, paid for it themselves, and then sold current to their consumers for considerably less than do the publicly owned power bureaus. It is virtually impossible to manage a socialized industry economically.

*The man or woman working under private enterprise appreciates by now that all of those something-for-nothing handouts from government are paid for most dearly by those employed in private enterprise.* There is, indeed, no place else government can go to get the billions it must have, not only to finance these handouts, but to pay the army of bureaucratic employees who do the handing out. For example, in my state, the worker drawing \$25 a week in "unemployment" is handed his checks by a state employee who draws \$25 dollars or more per day for this service, and who never fears a layoff as long as the employees of private industry are taxed to furnish, not only the hand-out money, but the fat salary of the man at the window of the "employment office."

**This system prevails** in every activity of the Welfare State. It is not difficult to see how unfair it is to the worker under the system of

private enterprise. The tragedy is that it cannot (or at least never has been) presented to the voters as a partisan issue. As in the case of England, all of our politicians believe this is the one sure way to garner the votes they need.

Having been employed in governmental bureaus for a number of years I know there exist honest, hard-working public employees. I am not so sure that we have as many honest and conscientious politicians. But I *do* know that we had better dig up a few as candidates in the 1960 elections, national and local, or we, the people of the United States, are going to be in for several more years of following the path to total socialization. Benjamin Franklin predicted that this republic probably would endure for 200 years, and we have about ten more years to prove that we had more sense than to sell out our freedoms as he feared we would.



*"This year, we need another Lincoln . . . but where are we to look for such a man . . . ?"*



**EMPIRE**

**CUT-OFF  
BLADES**

(LUGS TYPE)

The standard cut-off blade of all leading Machine Tool Manufacturers. Standard holders are available from stock for any machine using cut-off blades.

**EMPIRE**  
**TOOL COMPANY**

**FASTER, accurate cut-off**  
**LONGER cut-off blade life**  
**SMOOTHER cut-off surfaces**

#### **WIDEST RANGE OF BLADE MATERIALS**

1. Empire cut-off blades are available in four grades of H.S. Steel (high-cobalt, high-vanadium). Range covers most any requirement for H.S. Steel tooling.
2. Solid cast-alloy blades (non-ferrous, cobalt-chromium-tungsten) have high red-hardness, superior resistance to abrasion and are non-magnetic.
3. Carbide tipped cut-off blades come in four grades of carbide — the best carbide for each job can be furnished.



#### **SUPERIOR DESIGN FEATURES**

1. **Faster Cutting** — precision grinding of all blade surfaces assures sharper cutting edges.
2. **Reduced Friction** — hollow-ground top causes chips to collapse, relieving friction against sidewall of cut.
3. **Cooler Cutting** — collapsed chips permit coolant to reach blade cutting edges.
4. **Greater Precision** — blades are precision ground on all surfaces, centrality of head to shank is held to close tolerances.
5. **Smoother Cut-Off Surfaces** — sharper cutting edges, collapsed chips, better coolant flow, and liberal side clearances add up to smoother cutting.
6. **Longer Blade Life** — wide selection of blade materials, finest blade design, resharpening on front face only, assures longer life on every cut-off job.

*Made under license issued by John Milton Luers  
Patents, Inc.*

**11503 LAMBS ROAD • MEMPHIS, MICHIGAN**

For more data circle 428 on Postpaid Card

**"We have already lost our foreign markets . . ."**

*This year we need another Lincoln in the White House. But where are we to look for such a man this year? We are not likely to find him living in a log hut, and our colleges, which produce great scientists and technological experts, appear to have let us down in the matter of turning out another Lincoln. And all of our Presidents since 1900, with the exception of two, have been university products. Either our present system of education is not designed to turn out great statesmen, or we, the voters, have not had the wisdom to choose the great ones.*

Many of us can remember when we were told that the Presidential primaries would permit the people, and not a few selfish politicians, to select candidates. Then we were told that when women were given the right to vote politics would be cleaned up in a hurry. But as of 1960 there appears to be little improvement

in these matters over 1900. We still try to guess which of two candidates will do everything in his power to preserve our freedoms regardless of the pressures that may be exerted to persuade him to play along with those who hope to put an end to private enterprise in the United States.

**Time was when you could depend on a party label** to help you in picking the right man. Nowadays, you can't tell a Republican from a Democrat without a score card. So, this year, the workers within private industry are going to have to do a lot of studying of candidates for all public office to be positive that these men favor private industry and oppose building up an even greater bureaucratic burden for the taxpayer to carry on his already-overloaded shoulders.

This worker also would be most foolish if he voted for any candidate who favored continued reductions of duties on imports of manufactured products from abroad. It should be obvious that we cannot compete with cheap foreign labor without having to lower our own standards of living sharply. We have already lost our foreign markets for many such products, and anyone with eyes in his head can see that we are also being hurt by the ever-increasing infiltration of billions of dollars worth of fabricated material into our domestic markets.

Free trade sounds like a wonderfully altruistic ideal—until it results in layoffs of American workmen and even in the closing down of entire plants. Then we begin to wonder just



*"We Americans have been led to believe that 'imported' on an article enhances its value."*



A NEW "COMPACT" HITS THE MACHINE  
TOOL FIELD...

# THE NEW HARIG 612

## SURFACE GRINDER

with

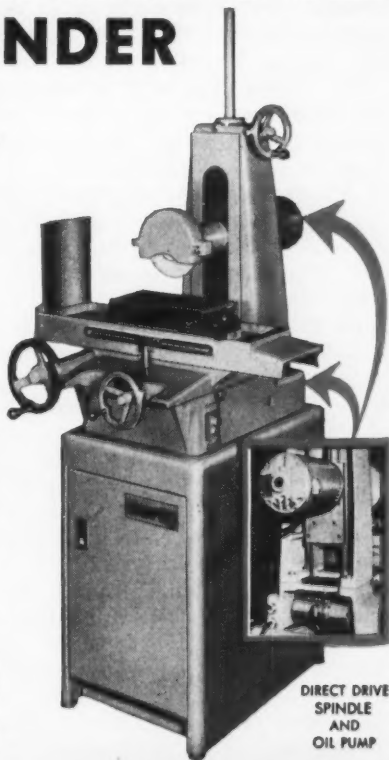
- \* **Automatic forced lubrication**  
goes into operation as soon as machine is started  
— triples life of the ways and preserves original  
accuracy.
- \* **Direct drive spindle**  
increases power . . . reduces vibration . . . no  
V-belts to replace.
- \* **Your choice of right or left  
hand longitudinal feed**

*All Standard Equipment*

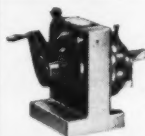
The new 612 represents a break-thru in design and construction whereby Harig now offers industry a low-cost, precision surface grinder loaded with features usually found only on expensive models. Easy to operate . . . requires little maintenance . . . built with the precision quality you expect from Harig.

### GET ALL THE FACTS . . .

Write for brochure on the  
Harig 612 Surface Grinder



DIRECT DRIVE  
SPINDLE  
AND  
OIL PUMP



#### HARIG'S NEW IMPROVED GRIND-ALL FIXTURE

Easily grinds irregular shaped perforators concentric with shank within  $\pm .0001$  accuracy. Also can be used as milling, boring and inspection fixture. NEW ATTACHMENTS: Radius Dresser Arm and Ball Seat Punch Adapter. (Write for new Grind-All Brochure.)

## Harig

*Manufacturing Corp.*

5765 W. HOWARD ST. • CHICAGO 48, ILL.

For more data circle 429 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 171

**"... study both the record and intentions of candidates."**

how long our economy can effectively withstand such unfair competition as this.

**No workers should be more fully aware of the hazards** in this case than those employed in the metalworking industry. If you go through any hardware store or department store, or just riffle through any catalogs issued by the big mail-order houses, you will be amazed how often products are marked (usually in fine print) as being imported from Japan, Germany, Italy, France, or England. *For some reason which is difficult to understand, even we Americans have been led to believe that "imported" on an article somehow enhances its value.*

In politics, the advocate of free trade will also be found campaigning for more and more public spending, either to increase our bureaucratic payroll burden or in order to buy some country's goodwill by financing industries that are already competing unfairly with our own. This type of idealist also conceives of the United Nations as more deserving of his fealty than the United States. It is not merely a coincidence that I have found so many of our state and federal department heads looking forward with great eagerness to the day when they can achieve to the management of a "cell" within the United Nations.

Americans have always had a reputation for practical hard-headedness in business, and for soft-heartedness in helping the unfortunate, either at home or abroad. It would appear that of late our impractical idealists among politicians and academicians

have placed all emphasis on the latter attribute.

*In the elections of 1960 the worker in private enterprise will do well to study both the record and the avowed intentions of all candidates, national, state, and local, to discover whether or not each of these is working in the interests of American industry or whether he is likely to use the powers which we give him to further the interests of those persons who are secretly or openly opposed to our present way of life.*

This is the problem each of us must solve, to the best of our ability, in the months between now and next November, and in all the elections in which we participate during the decade ahead. Upon our success in guessing right more often than not will depend the chances our children have of living in a free country some ten years or twenty years from now.



*"In the elections, the worker in private enterprise will do well to study both the record and avowed intentions of all candidates..."*

## Editorial

### TWELVE ACRES

Figures, sometimes, can be very impressive.

Five exhibit halls . . . twelve acres of floor space.

Over a thousand new-model machine tools in operation.

One hundred thirty exhibitors.

One hundred twenty thousand top executives, production men, engineers, plant managers and educators in engineering fields expected to attend.



But more important than figures . . .  
... the opportunity to view at first hand the latest and best in metalworking techniques.

... the opportunity to discuss time and money saving ideas with engineers who have made this field their lifetime work.

... the opportunity to compare what you now have with what you will be working with in the months and years ahead.

... the opportunity to view metalworking's future within the confines of twelve acres.

Plan now to attend THE MACHINE TOOL EXPOSITION - 1960 at the International Amphitheatre, Chicago, Illinois, Sept. 6 through 16.

May, 1960

# ONLY



is the originator  
and developer of  
the revolutionary  
new L-100-M

## SPEED-BAND®

double carbide  
Band Saws



# ONLY

available from  
authorized  
CAPEWELL  
Distributors



Ask your Capewell  
Distributor for  
the complete story



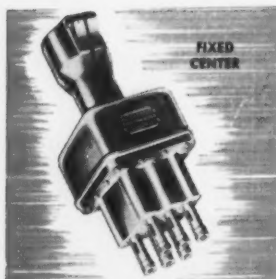
THE CAPEWELL MFG. CO.  
HARTFORD 2, CONN.

For more data circle 430 on Postpaid Card

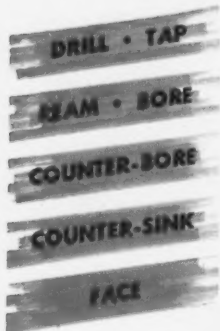
MODERN MACHINE SHOP 173

# RUGGED to full tool capacity!

**...FOR LONG WORKING LIFE  
TO ELIMINATE DOWNTIME & PRODUCTION LOSSES!**



## THOMSON THRIFTMASTER DRILLHEADS



Tremendous economies from the use of multiple-spindle drill-heads are obvious. Use **THOMSON THRIFTMASTER** Drill-heads for optimum performance and profits. Ask **NOW** for our new catalog.



1010 NORTH PLUM ST.  
LANCASTER, PENNA.  
EXpress 2-2101

Also Makers of DOBMAN AUTOMATIC REVERSE TAPPERS



For more data circle 431 on Postpaid Card

# Thor

Everything you want  
in Air Hoists . . .

*and more!*



Put a 30 lb. air hoist to work for you which lifts over sixty times its own weight. Easily handled by one man. Infinitely variable speed control from dead slow to 50 ft. per minute lift, 96 ft. per minute descent (1000 lb. model). Pendent or pull-cord control. Hook or trolley mounting. Roller or link chain. Automatic disc brake. 500, 1000, 2000 lb. capacities. Other models to 3 ton capacity. Your Thor factory representative or distributor will demonstrate in your own plant. Thor Power Tool Company, Aurora, Illinois. Branches in all principal cities.

For more data circle 432 on Postpaid Card

# Inexpensive Drawing Die

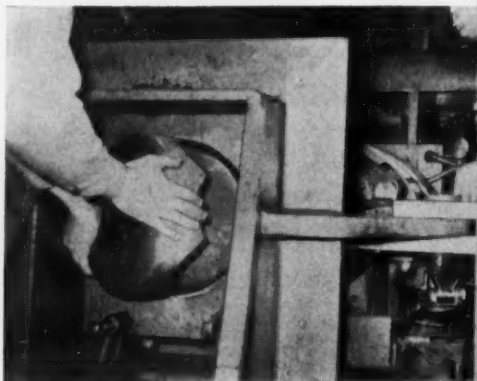
**Unique die for steel piling bottom caps is made by arc weld surfacing mild steel with a semi-austenetic deposit.**

By IRA S. ROBERTS

**Bottom caps for steel piling,** employed for marine and related applications have been produced in large volume by Damiano Brothers Welding Company, Inc., Providence, Rhode Island. These caps are drawn from blanks of 3/16-inch boiler plate in a 200-ton horizontal hydraulic press which has been set up in the company's shop.

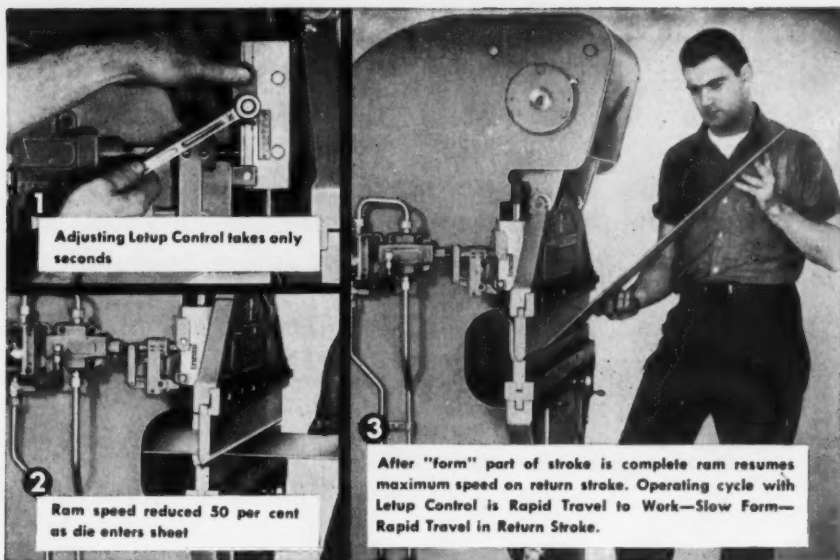
These heavy caps are produced with a die 4 inches thick having a 12½-inch diameter hole and a 4-inch drawing radius. The die was made by welding together two 2-inch pieces of mild steel. The abrasive motion of the metal against the die radius and hole wall would cause rapid deterioration of a mild steel die. To minimize this wear, the hole and radius were cut oversize and arc weld surfaced with a medium alloy deposit. The ¼-inch thick lining produced with Lincoln Abraso-weld was then ground to size. This metal has such high resistance to abrasion that the surfaces have shown only insignifi-

ficant wear, after producing 40,000 caps. The caps are made from square plate that undergoes a series of six cuts in a shearing die prior to forming. The shearing die has a 5½-inch radius and produces the scalloped edge of the cap that is especially desirable during driving operations.



**Heavy bottom caps for steel piling, employed for marine and related applications, are produced in large volume with the inexpensive drawing die shown in this illustration.**





## *Letup Control on New High Speed* **HYDRAULIC PRESS BRAKE**

- ★ *Eliminates whipping of material when forming*
- ★ *Makes for fast, safe forming of large sheets*

An adjustable flow control valve is the basic element in the Letup Control, an accessory for all Di-Acro Hydra-Power Press Brakes.

The 12 ton series of Di-Acro Hydra-Power Press Brakes are available in 3, 4, 6 ft. models. A 25 ton series is also available in 6 and 8 ft. bed lengths. All Di-Acro Press Brakes feature Stroke Adjustment that enables faster and safer forming and punching of sheet material—even by women and inexperienced operators.



**DI-ACRO  
HYDRA-POWER  
PRESS BRAKE**

**Heard about the new Di-Acro Rol-Form Dies?** They eliminate work marking of material, reduce number of die setups and cut changeover time in press brake operations. Also a complete line of standard Di-Acro Press Brake Dies are available.

*Write for literature, prices and delivery.*  
*pronounced die-ack-ro*



# **O'NEIL-IRWIN MFG. CO.**

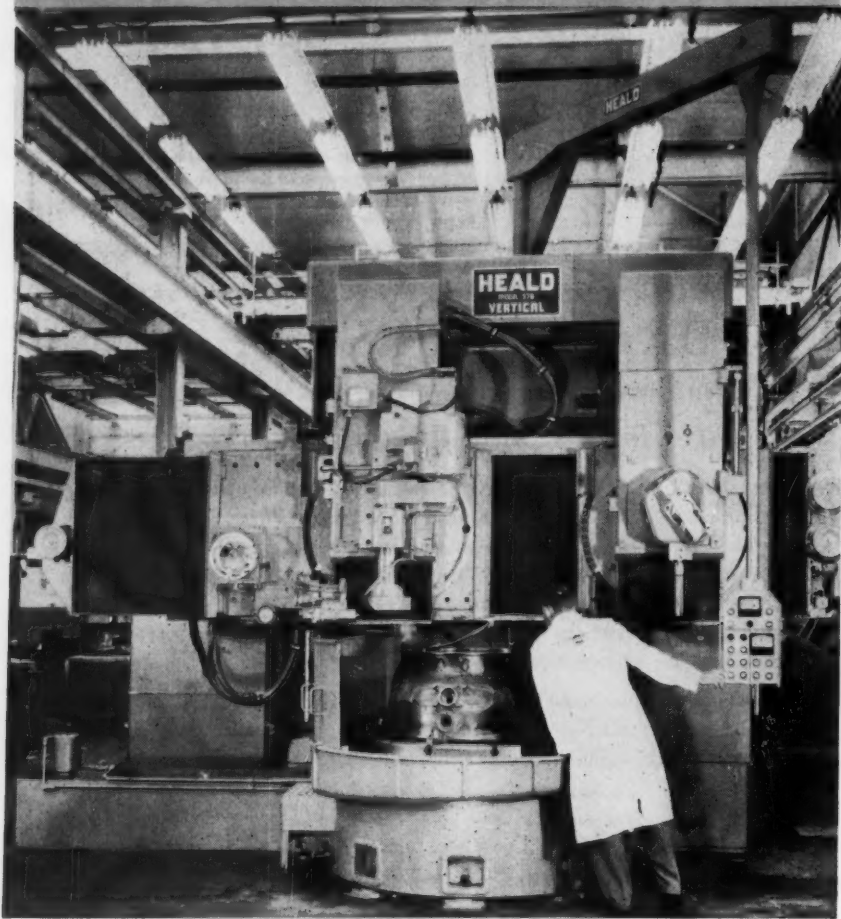
306 8th Avenue

Lake City, Minnesota

For more data circle 433 on Postpaid Card

# Jet Engine Overhaul

*New type of vertical machine revolutionizes  
overhauling of jet engines at United Air Lines'  
South San Francisco maintenance base.*



*Large Heald vertical machine installed at United Air Lines for jet engine overhaul.*

**United Air Lines is revolutionizing jet engine overhaul** at its new maintenance base at South San Francisco. The work is being done with a new type of vertical machine capable of a variety of grinding, boring, facing, turning and associated operations. Large enough to handle such large parts as turbine engine diffuser cases, the Heald 578 vertical can accommodate work up to 52 inches in diameter and 48 inches high. It is versatile enough for such jobs as: grinding tips of rotor blades; turning IDs and shoulders of aluminum rings in stator blades; turning and grinding stainless steel diffuser case joints; grinding bearing seats on shafts and in rotor shaft bores; and toolroom jobs such as grinding the planimeter rings for checking the shape of sheet metal sound suppressors, the holding fixtures used on the machine, and the tips of bushings in a ring jig for locating 80 ventilation holes inside the diffuser casing.

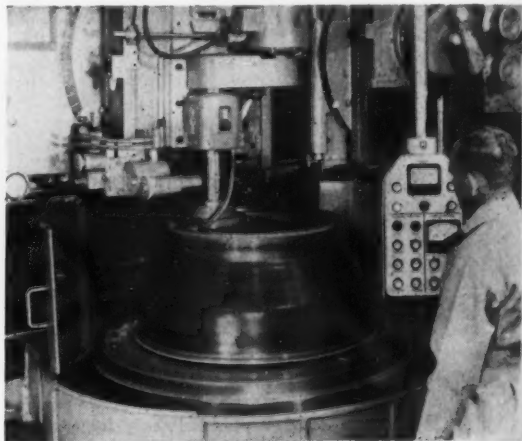
When the Pratt & Whitney engines which power the DC-8 Jet Mainliners enter the turbine overhaul and test section at United's 128-acre base they are stripped to individual components for preliminary cleaning. Such large parts as the diffuser cases are suspended on an overhead conveyor system for the hours-long trip through various solvents. After inspection, the stainless steel cases move to the Heald vertical for boring and turning operations.

Chrome plating levels the worn and pitted areas, after which finish grinding (at up to 6000 surface feet per minute) restores the part to dimension within a required tolerance of 0.0003 inch and 15 r.m.s. finish. Diffuser cases are held with four chuck jaws on the table. Rotor

and stator rings are clamped on the table with hold-down clamps between sheets of 1/4-inch thick rubber centered on a steel stud to prevent distortion during grinding. Carbide tools are held in the turret by ram type holders, and Cimcool coolant is used, circulating at 20 gallons per minute at 30 p.s.i.

Made by The Heald Machine Company, the 25-ton vertical has a ten-ton slide assembly which incorporates both a grinding head and a metal cutting turret. The five-position turret cutting compound, used primarily for roughing, holds five single-point tools for boring, facing, turning and associated operations. The grinding head is used for finishing operations and is capable of internal, face, external and rotary surface grinding.

Initial vertical positioning of slides is accomplished by raising or lowering the cross rail. Both the grinding and turret slides can be independently positioned horizontally along



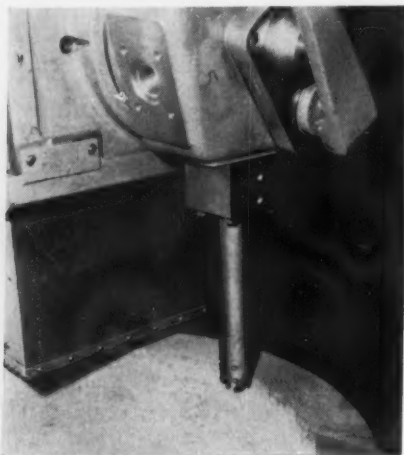
Close-up of machine showing large stainless steel turbine diffuser case being ground.

## Jet Engine Overhaul . . .

the cross rail, and each slide can be set for a predetermined length of stroke up to a maximum of 20 inches. The work table capacity allows face grinding of four-foot long shafts.

Table speeds range from  $2\frac{1}{2}$  to 180 revolutions per minute, and the slides reciprocate either automatically or manually at a rate of 0 to 10 feet per minute. Both the cutting and grinding slides have 20-inch travel and can swivel 45 degrees to either side of vertical for angular type operations.

Speeds and feeds, infinitely variable, can be remotely controlled from a pendant while the machine is operating. The operator can raise or lower the pendant 24 inches and swivel it around to any advantageous position, even to the rear of the



Beginning a heavy cut on a vertical boring mill part, the Heald 578 has a five-position turret compound used primarily for roughing which holds five single-point tools for boring, facing, turning and associated operations. It also incorporates a grinding head.

machine. For efficient operation, major controls are grouped into three sectors on the panel while infrequently used controls are on a column side panel.

The control system is unique in that speeds are controlled hydraulically from a remote position by electrically actuated throttles. Electro-hydraulic reversal of the grinding slide is effected without mechanical linkages by transistorized proximity limit controls.

★ modern machine shop ★

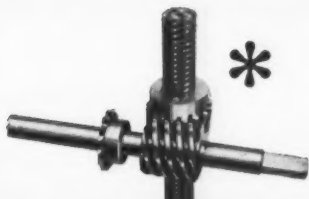
## Numerically Controlled Machine Tool Film

A 16 mm. color motion picture film, entitled "Numerical Control Manufacturing" is now available from Industrial Controls Section, Bendix Aviation Corp., 21820 Wyoming Ave., Detroit 31, Mich. This new film dramatically shows the advantages and cost savings resulting from the use of numerically controlled machine tools and how they are used in typical applications. The 22-minute film gives a complete description of the Bendix numerical control system.

Reported by news analyst Chet Huntley, the film is designed as a part of the overall program of showing all levels of production management the operation and advantages of numerically controlled machine tools. Featured in the film are Bendix numerically controlled machine tools in actual operation at such companies as Hamilton Standard, Pratt & Whitney, Wyman-Gordon and Ex-Cell-O, machining intricate part shapes such as cams, dies, turbine blades, and structural pieces.

**HIGH LIFT...  
HEAVY LIFT...  
OR BOTH!**

2741



# **PORTELVATOR®**

**ENGINEERED POSITIONING EQUIPMENT**



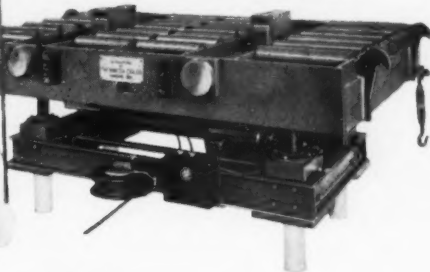
★ **PORTABLE or STATIONARY**

★ **manual or power operation**

★ **ANY KIND or DEGREE of MOVEMENT**

★ **manual or completely automatic controls**

★ Portelvator's mechanical power transmission design locks the top-plate by gravity in any attained position. Application of this transmission to multiple elevating screws provides unequalled safety.



**IT'S A  
HAMILTON TOOL  
USE IT  
WITH CONFIDENCE**

**Write for  
FREE LITERATURE BATCH No. P-801**

**THE HAMILTON TOOL COMPANY  
828 SOUTH NINTH STREET • HAMILTON • OHIO**

For more data circle 434 on Postpaid Card

# Program

## Triple Industrial Supply Convention Chicago, Illinois

### SUNDAY, MAY 22, 1960

9:00 a.m. to 7:00 p.m.	Registration
9:00 a.m. to 12:00 noon	NIDA-SIDA Council on Industrial Distribution
9:30 a.m. to 11:00 a.m.	ASMMA Executive Committee Meeting
11:00 a.m. to 12:00 noon	ASMMA Board of Directors Meeting
12:00 noon	Luncheon of all Officials and Advisory Boards of NIDA, SIDA and ASMMA
2:00 p.m.	NIDA Officers, Board of Governors, and Advisory Board
2:00 p.m.	SIDA Officers, Executive Committee, and Advisory Board
5:00 p.m. to 6:30 p.m.	Opening Reception (Ladies Invited)

### MONDAY, MAY 23, 1960

8:30 a.m.	ASMMA New Members' Breakfast
9:00 a.m. to 5:00 p.m.	Registration
10:00 a.m. to 12:00 noon	Opening Meeting (Ladies Invited)
12:00 noon	Past Presidents' Club Luncheon
2:00 p.m. to 5:00 p.m.	Meeting of NIDA and SIDA (ASMMA Members Invited)

### TUESDAY, MAY 24, 1960

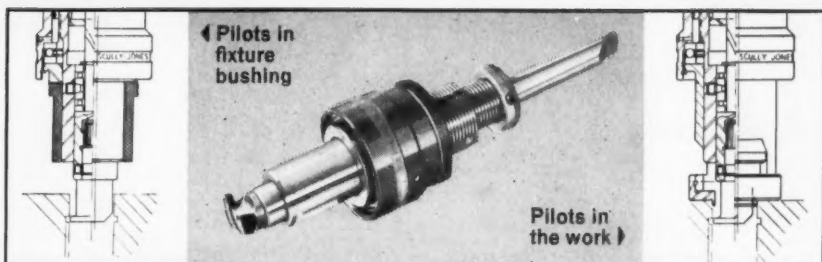
8:30 a.m. to 4:00 p.m.	Registration
9:00 a.m. to 5:00 p.m.	Conference Booth Program Donovan Hall—International Amphitheatre
12:30 p.m.	Ladies' Luncheon and Fashion Show
6:00 p.m. to 7:30 p.m.	Cocktail Party Reception and Cocktails for all members of the three Associations (Ladies Invited)

### WEDNESDAY, MAY 25, 1960

8:30 a.m. to 11:00 a.m.	ASMMA Annual Meeting—Breakfast
8:30 a.m. to 11:00 a.m.	NIDA Annual Meeting
8:30 a.m. to 11:00 a.m.	SIDA Annual Meeting
12:30 p.m.	Closing Luncheon Meeting (Ladies Invited)

Additional information regarding the Convention can be obtained by writing to the American Supply and Machinery Manufacturers' Association, Inc., 2130 Keith Building, Cleveland 15, Ohio.





# building-block design boosts recessing tool work range

The building-block design principle used in Scully-Jones new automatic recessing tools increases work range of each tool, reduces inventories and tooling costs. Designed for use in drill presses, radial drills, and special machines, these new tools cover a range of work hole diameters from  $\frac{1}{4}$ " to  $4\frac{1}{2}$ " and depth of cut to .300".

Four sizes of tools are available with interchangeable stop collars and pilot nose assemblies for piloting either in fixture bushings or in the work. Three sizes of tools are provided for piloting in the work only, and come with

standard pilot nose blanks which can be machined to hole size requirements. Both types of tool are available with concentric or eccentric tool bit mounting, depending on the tools to be used and type of work. Feed is automatic and continuous, controlled by a lead cam in the tool. Adjustable collars speed setting for location, depth of cut.

For complete information, contact your Scully-Jones representative or distributor; or call direct, B1shop 7-5900

**Scully-Jones and Company**

1909 South Rockwell Street, Chicago 8, Illinois



Micrometer fixture for grinding circular form tools—eliminates cut and try.

Presetting gage sets tools for location, depth of undercut.



**SCULLY  
JONES**

**RECESSING  
TOOLS**

For more data circle 435 on Postpaid Card

# Ideas from readers

*Several time-saving ideas and suggestions for the man in the machine shop.*

## Tool Tray for Turret Lathe

By H. J. GERBER

The tool tray illustrated **here-with** was designed and built to provide a safe and convenient place to hold measuring instruments and other tools on the turret lathe. The tray is placed on the top of the turret where it will be within close reach of the operator and at the same time keep the tools free of chips and cutting oil. The tray is quickly removable as it is not held by fasteners and can be simply lifted off when necessary. It is retained in place by a wood plug fitted to the bottom of the tray

and seating snugly into the central hole of the turret.

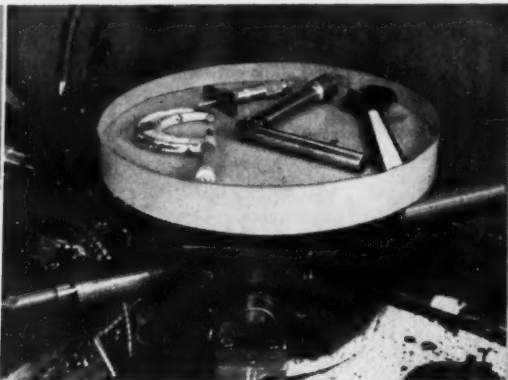
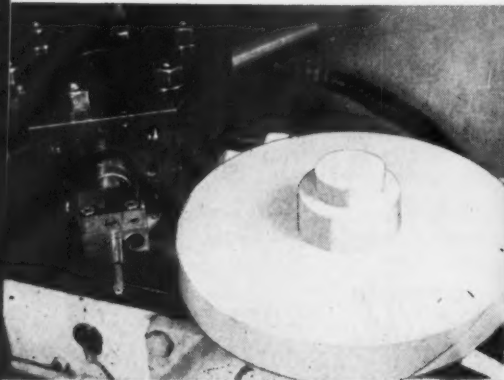
The tray shown was made of wood with a sheet metal rim. A metal tray would be more durable but the wood surface is more desirable in contact with precision instruments.

★ modern machine shop ★

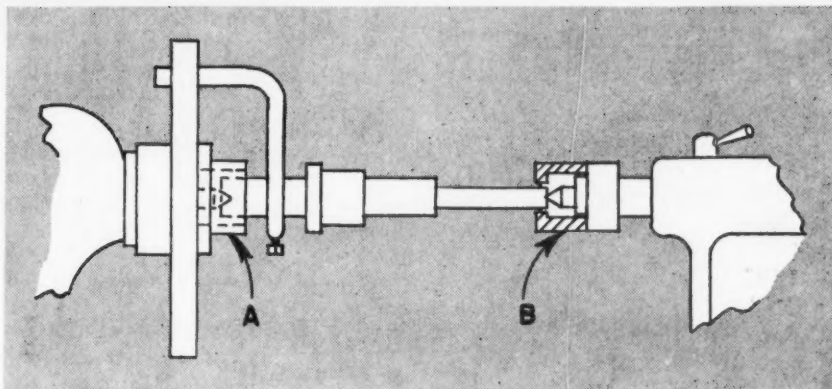
## Shaft Center Locating Devices

By CLINT McLAUGHLIN

We have been working on some long-run jobs which involve the turning and grinding of rather



Left view shows tool tray turned upside down. Right view shows how tray is used on lathe.

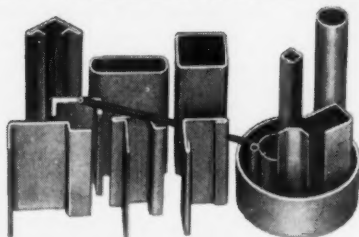


Sketch showing two simple devices for use in quickly locating heavy step shafts on centers.

heavy step shafts. To speed up and facilitate the task of locating these shafts on centers in the lathe and grinder, we made up two devices, as shown in the accompanying sketch.

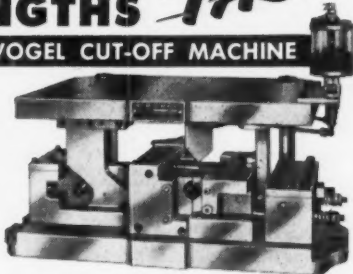
One device, A, consists of a flanged ring which is mounted on the drive plate as shown. The other device, B, is a piece of tubing which is fitted to the tailstock spindle. The front half

## SHEARS CLEAN TO ACCURATE LENGTHS *FAST!*



With each press stroke, unit accurately cuts off tubing and shapes into lengths of  $\frac{1}{2}$ "  $\pm .010$ ", or more. The ends are cut clean with a minimum of burr or distortion . . . Shearing blades make thousands of cuts before resharpening.

### VOGEL CUT-OFF MACHINE



No. 12 unit cuts up to  $\frac{3}{4}$ " O.D. x  $\frac{3}{32}$ " wall.  
No. 2 unit cuts up to 2" O.D. x  $\frac{1}{8}$ " wall.  
No. 3 unit cuts up to 3" O.D. x  $\frac{3}{16}$ " wall,  
or up to  $3\frac{1}{2}$ " O.D. x  $\frac{1}{8}$ " wall.  
Odd shapes handled in sizes equivalent to unit's O.D. capacity.

**V**OGEL TOOL & DIE CORPORATION  
1823 NORTH 32ND AVENUE, STONE PARK, ILLINOIS

For more data circle 436 on Postpaid Card

# Only PENNIES PER DAY Buy This Compact MIST COOLANT UNIT

TRICO

TYPE  
"J"



\*Complete With  
Magnetic Nozzle  
Holder As Shown

Especially designed for small precision machinery used for drilling, tapping, sawing, grinding, etc. Removes heat from cutting edges of tools and increases production and tool life as much as 500%. Check these plus values:

- —compact . . . measures 3" x 5"
- —separate air and coolant controls
- —convenient mounting stud
- —attaches to existing shop airline
- —shatter-proof 8 oz. reservoir
- —neoprene flexible coolant line
- —magnetic nozzle holder positions anywhere
- —controlled discharge

Larger Types and Capacities Available.

SEND FOR BULLETIN 37

TRICO FUSE MFG. CO.  
MILWAUKEE, WIS. U.S.A.

For more data circle 437 on Postpaid Card

186 MODERN MACHINE SHOP

## ideas from readers . . .

of this device is cut away partly to provide clearance for the lathe tool or grinding wheel. Both devices, A and B, are bored to an I.D. slightly larger than the work which, when loaded by hand, is easily located on centers with the aid of these devices.

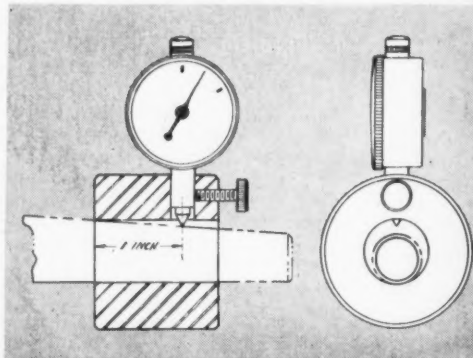
★ modern machine shop ★

## Gage for Checking Taper

By HAROLD SEDLIK

A frequently used method for checking taper is to mark off one inch and, with the aid of a micrometer, measure the large and small diameter in order to establish the taper per inch; however, this procedure is slow and inaccurate.

Illustrated in the accompanying sketch is a simple gage for checking taper which consists of a dial indicator mounted to a ring as shown. The indicator will give direct taper per inch reading, thus eliminating the need for any calculations, as when using the aforementioned method.

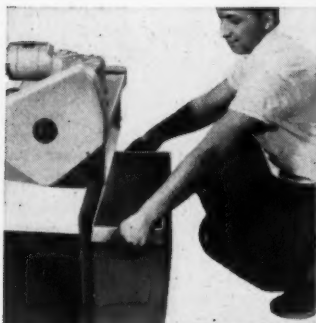


Sketch of simple gage for checking taper.

May, 1960

# In no time at all, you can install a Sundstrand Coolant Separator

**...to improve  
grinding  
honing and  
gear shaving**



Permanent Alnico magnet drum revolves against coolant flow . . . attracts and separates magnetic particles quickly and easily. Separated material is removed from the drum by a scraper and deposited in an easily removed receptacle or sludge pan. Sludge pan can be removed for cleaning in a few seconds. No tools are required.



Sundstrand magnetic coolant separators set right into open coolant tanks on most machines . . . no repiping or fitting necessary. Once the separator is in place, you simply connect the drive motor wiring and you're in business. The entire installation takes maybe an hour or less and then your savings start immediately: Reduced down time and lower coolant costs (no sump cleaning), improved surface finishes, longer wheel life, and fewer rejects. Four capacities: 25, 50, 75, and 100.

*Bulletin No. A-565 gives complete data . . . write for your copy today.*

MARK OF



RELY-ABILITY



## SUNDSTRAND-AMERICAN BROACH

MAGNETIC DEPT., ANN ARBOR, MICHIGAN

Division of SUNDSTRAND CORPORATION

For more data circle 438 on Postpaid Card



**Use Postpaid Cards opposite Page 32 and Inside Back Cover for requesting free copies of literature listed below.**

#### **Milling Cutters and Gear Hobs**

The Hanson-Whitney Co., 269 Bartholomew Ave., Hartford, Conn. New catalog and net price list on multiple thread milling cutters and fine pitch gear hobs, available from stock on immediate delivery. Much helpful information is included on selecting the right kind of thread milling cutters and gear hobs and how to order.

**For more data circle 457 on Postpaid Card**

#### **Clamps**

Arvids Iraids, 5930 Argus Road, Cincinnati 24, Ohio. Four page color brochure on multi-spring clamps with pivoting jaws. These are tools for a quick and sure way to hold all types of mitre joints and many other jobs where holding the pieces together has been a time consuming problem.

**For more data circle 1 on Postpaid Card**

#### **Heavy Duty Power Tools**

The Stanley Works, Stanley Electric Tools Division, Myrtle St., New Britain, Conn. Brochure presents data on Stanley's advanced new line of 16 industrial power tools, including 7 inch polisher, two speed drills,  $\frac{1}{2}$  and  $\frac{3}{4}$  inch drills, reversible drills, 7 and 9 inch disc sanders, 5 and 6 inch portable grinders, routers, saws, belt sanders, power planes, electric hammers, bench grinders and Unishear Cutting Tools.

**For more data circle 439 on Postpaid Card**

#### **Furnace Transformers**

Dresser Electric Co., 2705 Wright St., Detroit 7, Mich. Flyer on Dresser Air Cooled Dry Type Furnace Transformers, custom engineered to meet the exacting requirements for controlling electrically heated furnace zones.

**For more data circle 2 on Postpaid Card**

#### **Form Grinder**

The Sheffield Corp., Dayton 1, Ohio. Catalog No. FC-181-260 presents the Model 181 Multiform Grinder, a machine for grinding annular forms and grooves in workpieces up to 10 inches in diameter and 24 inches between centers.

**For more data circle 3 on Postpaid Card**

#### **Toolholders**

Burgmaster Corp., 15001 South Figueroa St., Gardena, Calif. Four page color bulletin on Tool-flex Full Floating Toolholders, which automatically compensate for parallel and angular machine spindle misalignment.

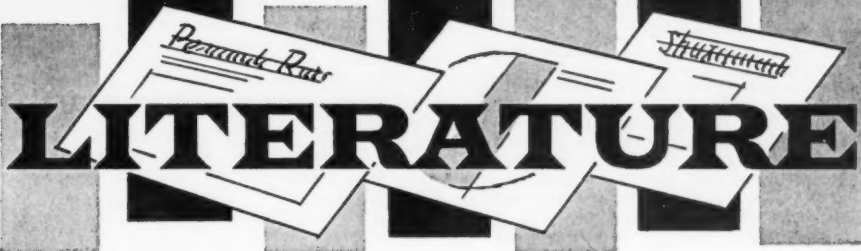
**For more data circle 4 on Postpaid Card**

#### **Cutting Tools**

Rico Tool Co., 5915 Dixie Highway, Saginaw, Mich. New and attractive color catalog presents the company's complete line of quality rotary carbide and high speed cutting tools. It also introduces a new line of burrs and countersink sets.

**For more data circle 463 on Postpaid Card**





# LITERATURE

## Boring and Facing Heads

Mummert-Dixon Co., 120 Philadelphia St., Hanover, Pa. Four page bulletin on the "Swintool" Hydraulic 5 Inch Boring and Facing Head. Also, a four page bulletin on "Swintool" Precision Bar Type Boring Heads, which have extreme strength and rigidity and will do a man-sized job, complete with high accuracy and finish.

For more data circle 460 on Postpaid Card

## Cylinders, Rods, Boosters

Flick-Reedy Corp., 7N023 York Road, Bensenville, Ill. Bulletin P2547P lists, under one cover, the products of both the Miller Fluid Power and Tru-Seal Divisions. Products covered include air cylinders, hydraulic cylinders, non-sag piston rods, high speed cushions, adjustable stroke cylinders, air-hydraulic boosters, air-oil circuits and Tru-Seal pipe thread fittings for eliminating positioning problems and leakage at threaded connections.

For more data circle 440 on Postpaid Card

## Alloys

Ampco Metal, Inc., Box 2004, Milwaukee 1, Wis. Bulletin 33e contains chemical and physical properties of a series of special aluminum bronze alloys. Nine major grades and heat treated variations are described in this 20 page, two color bulletin.

For more data circle 5 on Postpaid Card

## Sealant

American Sealants Co., Hartford 6, Conn. Eight page color brochure features data on Loctite Sealant, the liquid lock for metal parts. The folder shows how to simplify assembly of metal parts at less cost and with greater reliability.

For more data circle 6 on Postpaid Card

## Lubricant

The Alpha-Molykote Corp., 65 Harvard Ave., Stamford, Conn. New four page, four color bulletin describes the wide industrial application of Molykote Type G, a grease consistency lubricant. Bulletin discusses how Molykote G reduces galling, seizing and metal pickup in high pressure and high temperature applications. A small sample tube, accompanying Bulletin 126B, may be obtained without cost.

For more data circle 7 on Postpaid Card

## Tap Holder

Brookfield, Inc., Stoughton 111, Mass. Bulletin on the Brookfield Non-Releasing Tap Holder, a new design that makes tap setup both quick and easy.

For more data circle 8 on Postpaid Card

## Punch and Die Maker

Rice Pump and Machine Co., 226 Park Ave., Belgium, Wis. Bulletin No. DF 1-26 presents the Model PDM Punch and Die Maker. This machine is said to be the complete answer to larger diemaking requirements and at low cost. Information is also included on the Model PDF Die Filer.

For more data circle 459 on Postpaid Card

## Pressure Gage

American Chain and Cable Co., Inc., Helicoid Gage Division, 931 Connecticut Ave., Bridgeport 2, Conn. A colorful and concise four page folder, Bulletin DH-333, describes the complete line of Type 110 Gearcoid Gages, pressure instruments designed for a wide range of industrial applications. Engineering data showing details of construction, outstanding features, applications, specifications, pressure ranges and dimensions are listed for easy reference.

For more data circle 9 on Postpaid Card

**free literature . . .**

#### **Shock Testing Machines**

Barry Controls, Inc., 700 Pleasant St., Watertown 72, Mass. Bulletin 59-07 presents the Barry Varipulse Shock Testing Machines. Varipulse is a complete line of shock testing machines to accommodate a wide variety of test requirements: gravity free-fall principle, repeatable pulses, simple and fast operation, built-in safety features, clearly defined half-sine, sawtooth, square waves.

**For more data circle 10 on Postpaid Card**

#### **Electrodes**

Arcair Co., Post Office Box 431, Lancaster, Ohio. Literature describes special electrodes used with the Arcair Process. The brochure lists the different types of electrodes available for use with Arcair torches, recommended current settings for welding machines and other valuable information.

**For more data circle 11 on Postpaid Card**

#### **Hack Saw Blades**

Borg-Warner Corp., Atkins Saw Division, Indianapolis 25, Ind. Descriptive literature features Atkins Silver Streak

High Speed Steel Hack Saw Blades. The folder contains handy tables of manufacturers recommendations for speed and feed of power saws, types of saws and teeth to use for various metals, useful tips on the use of hand hack saws and illustrations and specification tables for the complete Atkins line of metal cutting blades.

**For more data circle 12 on Postpaid Card**

#### **Valves**

Hunt Valve Co., Salem, Ohio. Bulletin No. 594 on Hunt PDQ Valves, which feature accessibility, simplicity, speed, capacity, price and quality.

**For more data circle 13 on Postpaid Card**

#### **Punches**

Dayton Perforators, Inc., 1336 Stanley Ave., Dayton 4, Ohio. Four page color publication on Dayton Pups (Proven Usage Punch Sizes). Complete dimensions and price information are included.

**For more data circle 14 on Postpaid Card**



Now you specify added safety when you order Stanley Ball Pein Hammers. Exclusive Stanley rim tempering minimizes chipping of critical area . . . assures greater safety for users.

Available with triple wedged "Evertite" selected hickory handles in 10 sizes from 2 to 48 ounces.

Write for new catalog, "Stanley Tools for Industry" to Stanley Tools, Division of The Stanley Works, 9105 Elm Street, New Britain, Connecticut.

# STANLEY

**For more data circle 439 on Postpaid Card**

#### Reciprocating Tool Grinder

Ex-Cell-O Corp., Detroit 32, Mich. Two models of reciprocating tool grinders are illustrated and described in this new folder. One model is built for conventional grinding, the other for the electrolytic process. Bulletin 465927 illustrates and describes both models, gives complete specifications and shows some accessories useful in sharpening tools. **For more data circle 15 on Postpaid Card**

#### Ultrasonic Metal Cleaning Equipment

Branson Ultrasonic Corp., 37 Brown House Road, Stamford, Conn. Bulletin No. G-2 on the Sonogen Model AC-25 Degreasing Unit and the Model APT-500. Data is also included on the Vidi-gage Thickness Tester, the Audi-gage Model 6 Ultrasonic Thickness Tester and the Sonoray Flaw Detector.

**For more data circle 16 on Postpaid Card**

#### Coding Machine

Pryor Marking Products, 434 South Wabash Ave., Chicago 5, Ill. Flyer on the Powermark II Electric Numbering Coding Machine for carbon interleaved forms, insurance papers, client numbers or shop ticket coding. **For more data circle 17 on Postpaid Card**

#### Machinery Mounts

The Felters Co., Unisorb Division, Department WCH, 210 South St., Boston 11, Mass. All types of machinery mounts are described in this six page bulletin. Three basic types are covered: Unisorb Pads, Unisorb Level-Rite and Level-Rite "UL". **For more data circle 18 on Postpaid Card**

#### Convex Turning Attachments

International Machine and Tool Corp., Post Office Box 3595, Cranston 10, R. I. Six page color bulletin on Bilz Convex Turning Attachments and Concave Turning Attachments.

**For more data circle 19 on Postpaid Card**

#### Air Tool

The Ashcombe Co., York, Pa. Four page color brochure on the Ashcombe Airotor, an industrial tool for ultra high speed removal of metal, and other materials, to precision tolerances.

**For more data circle 20 on Postpaid Card**

**Up To  
10,000 psi Oil  
from Shop Air**

**MILLER** **AIR-HYDRAULIC  
BOOSTERS**

**No Pumps or High Pressure Valving Needed**

Hook a Miller Air-Hydraulic Booster to your air line and get **INTENSIFIED** hydraulic power that you can vary and control at will and use for such common shop operations as punching, clamping, pressing, riveting, shearing, welding, crimping, testing, etc. Boosters save air, space, weight, require little or no maintenance and hold pressure as long as desired without additional power consumption. **Models for immediate delivery.**

**Write For  
Full Details**

**MILLER** **FLUID POWER DIVISION**  
Flick Ready Comp.

**For more data circle 440 on Postpaid Card**

## free literature . . .

### Stamping and Roll Marking

The Acromark Co., 9 Morrell St., Elizabeth, N. J. "Pointers on Marking Metals and Plastics" is an eight page folder on some of the technical details involved in stamping and roll marking, including a pressure chart for various sizes of characters, amounts of tonnage pressure needed for stamping in steel, numbering and marking machines required for marking metals and plastics.

For more data circle 21 on Postpaid Card

### Cutter and Reamer Grinder

Union Twist Drill Co., Hartex Division, Athol, Mass. Six page color bulletin on the Number 1 Universal Cutter and Reamer Grinder for grinding clearances on cutters and reamers, straight or spiral flute, shank or arbor type, cemented carbide or high speed steel. Information is included on extra accessories and attachments.

For more data circle 22 on Postpaid Card

### Vapor Generator

Associated Technical Sales Co., 3629 North Dixie Drive, Dayton, Ohio. Brochure on Coolie-Toolie Vapor Generator, which removes heat from tools and machine surfaces in cutting, grinding, milling, shaping, drilling, tapping or stamping operations. This well illustrated brochure includes complete description, suggested applications, plus information on multi-line units and Coolie Coolant Concentrates.

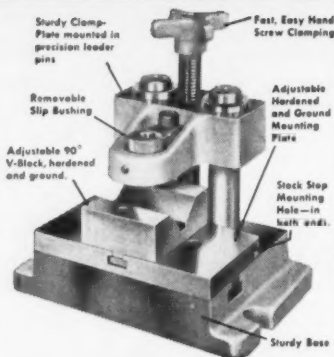
For more data circle 23 on Postpaid Card

## REPCO Time-Saving Tools

### ADJUSTABLE V-BLOCK DRILL JIG

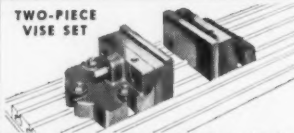
Saves Set-Up Time—  
Increases Output

Here is a versatile and accurate V-Block that makes center and off-center drilling, tapping, and reaming easy and precise. Four-way V-block adjustment simplifies handling a wide range of work. Fast, easy positioning and clamping speed production. A centering locator plug and T-slots in the mounting surface plates assure fast, easy, on-center adjustment. Drill capacity  $\frac{1}{8}$  to  $\frac{1}{2}$ " diameter. Handles stock from  $\frac{1}{4}$ " to 2" diameter.



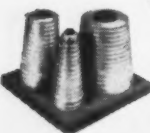
### TRUE-CENTER ADJUSTABLE TOOL HOLDER

The REPCO Adjustable Holder is a precision-built tool, having two-piece construction which provides fast adjustment of the main body to compensate for as much as  $\frac{1}{16}$ " machine misalignment. Cuts down on tool wear, breakage, and scrap.



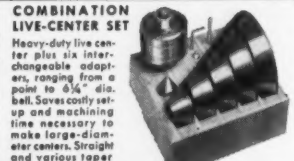
### TWO-PIECE VISE SET

Save time with this versatile 2-Piece Machine Vise Set. Use as general-purpose vise, angle-block, or separate clamping device. Opening limited only to length of machine base. Light, accurate, rigid. Two sizes: 6" and 8".



### CHUCK JAW TRUING-RING SET

This Ring Set saves time, cuts cost of boring jaws. With correct diameter rings at hand, you gain hours of productive time. Plated rings range from 1" to 4" by  $\frac{1}{16}$ " increments. Handy peg-type rack keeps rings in place.



### COMBINATION LIVE-CENTER SET

Heavy-duty live center plus via interchangeable adapters, ranging from a point to 6 1/4" dia. ball. Saves costly set-up and machining time necessary to make large-diameter centers. Straight and various taper shanks available.



Write for complete information—Exclusive agent territories open.

ROCKFORD ENGINEERED PRODUCTS CO.

23rd Avenue and 20th St. • Rockford, Illinois

For more data circle 441 on Postpaid Card

### Steel Tubing

Copperweld Steel Co., Ohio Seamless Tube Division, Shelby, Ohio. Both seamless steel tubing and electric welded steel tubing are described in this eight page Catalog CS-60. Carbon and alloy steel grades of seamless tubing are covered in mechanical, pressure, aircraft mechanical and air-frame categories. For more data circle 24 on Postpaid Card

### Screw Feeders

Wales Strippit, Inc., 207 Buell

Road, Akron, N. Y. Flyer on the Strippit Zipp Screw Feeders for vertical screw-driving operations. They eliminate manual screw placement, speed screw assemblies, reduce errors and rejects, fit all makes of pneumatic and electric tools and are precision built and factory set. For more data circle 25 on Postpaid Card

#### **Finishing and Polishing Machines**

Production Machine Co., Greenfield, Mass. Four page color Bulletin No. 12 presents centerless finishing and polishing machines, which require no center-

ing and no chucking—just feed automatically. Units are available for wet or dry operations.

For more data circle 26 on Postpaid Card

#### **Metal Worker**

Homestrand Machine Tool Corp., 392 West Putnam Ave., Greenwich, Conn. A brochure covering the GV Metal Worker, Type Junior. It is a sheet and plate working machine with an edge cutting capacity in mild steel of 5/32 inch.

For more data circle 27 on Postpaid Card

## One of these Wilson "Rockwell" instruments will do your hardness testing job

No matter what your hardness testing requirements are, there's a Wilson "Rockwell" tester to do the job. Choose from this complete selection of hardness testing equipment:

**"Rockwell" Hardness Tester**—for most hardness testing functions.

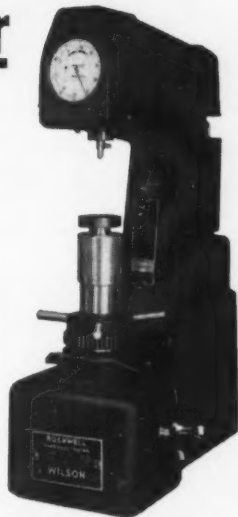
**"Rockwell" Superficial Tester**—for extremely shallow indentations.

**TwinTester**—Combines functions of "Rockwell" and "Rockwell" Superficial testers.

**Semi and Fully Automatic**—for high-speed testing, at rates up to 1,000 pieces per hour. Automatically classifies pieces as CORRECT, TOO HARD, or TOO SOFT.

**Special Machines**—for testing large objects, internal readings, and other unusual applications.

**Diamond "Brale" Penetrators**—Flawless diamonds, individually calibrated, and highest quality construction assure perfect testing every time.



Write for  
Bulletin RT-58

## WILSON "ROCKWELL" HARDNESS TESTERS

Wilson Mechanical Instrument Division  
American Chain & Cable Company, Inc.

230-G Park Avenue, New York 17, New York

For more data circle 442 on Postpaid Card



**free literature . . .**

**Hack and Band Saws**

Spartan Saw Works, Inc., Springfield, Mass. Spartan Guide for Proper Use of Machine Saw Blade Cutting.

For more data circle 28 on Postpaid Card

**Carbide Cutting Tools**

Dixie Tool Industries, 4555 West Franklin Ave., Bridgeport, Mich. The company's complete line of standard carbide cutting tools and special engineering

services are presented in Catalog No. 114. It contains 24 pages and is fully illustrated in two colors. Complete specs are given on end mills, die sinking, routing and keyway cutters, drills, burrs and file sets. The catalog introduces a solid carbide bore reamer that bores and reams, all in one operation.

For more data circle 29 on Postpaid Card

**Countersinks**

The Cleveland Twist Drill Co., 1242 East 49th St., Cleveland 14, Ohio. Informative folder entitled "How to Get Better

Countersunk Holes at Lower Cost" discusses the important factors in countersinking, recommends the types of countersinks to use in various materials for both portable and machine work and gives helpful information on regrounding.

For more data circle 30 on Postpaid Card

**Hand Grinder**

The Dumore Co., 1302 Seventeenth St., Racine, Wis. Flyer on the Series 40 High Speed Hand Grinder, which is ideal for use with carbide burrs, as well as mounted wheels.

For more data circle 31 on Postpaid Card

**Ram Benders**

Wallace Supplies Manufacturing Co., 1804 West Cornelia Ave., Chicago 13, Ill. Ram benders for forming iron pipe and channels and bars of steel, copper, brass, stainless and monel are described in the current Wallace Catalog. Size range of benders is for 1/2 inch o.d. tube to 16 inch o.d. pipe.

For more data circle 32 on Postpaid Card



**PRODUCES MORE AND  
BETTER PIECES BETWEEN  
DIE CHANGES.**

A graphited product for use in working hot metals of all kinds. Good in temperatures up to 2200° F and above. Keeps work cool and extends the life of dies and punches. Highly adhesive, may be applied by brush or swab or diluted with oil for spraying.

Bulletins describing Fiske's 514A Hot Die Lubricant and other specialty lubricants and coolants sent on request.



**METAL WORKING  
LUBRICANTS**

**FISKE BROTHERS REFINING CO.**

129B LOCKWOOD STREET, NEWARK 5, N. J.

Plants: Newark 5, N. J. Toledo 5, Ohio

For more data circle 443 on Postpaid Card



#### Socket Cap Screws

The Bristol Co., Waterbury 20, Conn. Bulletin 769 on the Bristol Diamond Knurl Socket Cap Screws.

For more data circle 33 on Postpaid Card

#### Motor Couplings

Link-Belt Co., Department PR, Prudential Plaza, Chicago 1, Ill. Leaflet 2875A and Folder 2875 on Type MC low cost geared couplings, designed for electric motor applications.

For more data circle 34 on Postpaid Card

#### Precision Spindles

Pope Machinery Corp., 261 River St., Haverhill, Mass. Pocket size, 32 page Bulletin S-18 pictures and describes over 60 different types of Pope Precision Spindles for grinding, boring, milling, slotting and drilling, including the newest high frequency spindles and "Ano-cut" spindles arranged for electrolytic grinding. Precision interchangeable extension arbors and wheel holders and spindle rebuilding and repair service facilities are also described.

For more data circle 35 on Postpaid Card



## ETALON INGAGE

measures the  
exact BORE or  
blind hole size!

Reading: .0001"

Size: 3/16" to 4".

Takes accurate measurements of blind holes. No masters or setting rings—measures directly—by .0001".

Automatic alignment, rectangular contact points guarantee extreme accuracy even when fully extended. Immediately detects out of round holes; with extensions measures holes up to 6 feet deep. Hardened contact points exert minimum pressure—will not damage fragile work.

Easy to read, deep graduations on a large diameter thimble. Dull chrome plated. Furnished in English or Metric graduations, individually or in sets.

WRITE FOR CATALOG on complete line of precision measuring instruments: VERNIER CALIPERS, MICROMETERS, DIAL INDICATORS.



ALINA  
CORPORATION  
122 East Second St.  
Mineola, L. I., N. Y.

For more data circle 444 on Postpaid Card

## free literature . . .

### Cylinders

Allenair Corp., 255 East Second St., Mineola, N. Y. Flyer on Type "AS" Cylinders—double acting or spring return (air pull or air push).

For more data circle 36 on Postpaid Card

### Broaching Fixtures

National Broach and Machine Co., 5600 St. Jean, Detroit 13, Mich. Catalog B60-1 is a new 12 page, two color, revised publication that describes Red Ring

Unitized Broaching Fixtures. This profusely illustrated catalog describes a variety of self-contained, air powered broaching fixtures for producing keyways, slots, flats, small splines, oil grooves, serrations, deburred surfaces and holes of various shapes.

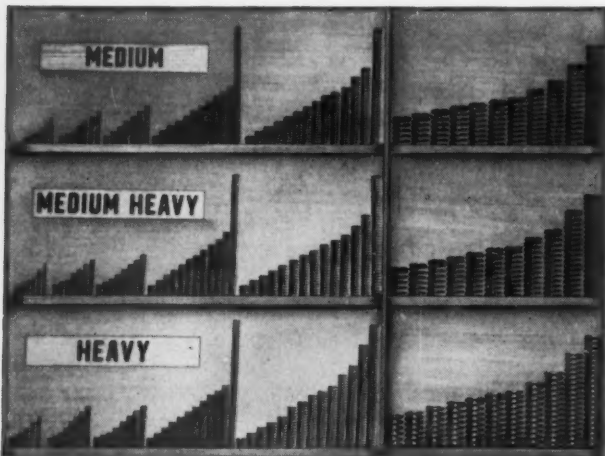
For more data circle 37 on Postpaid Card

### Classifying System

Cleveland Instrument Co., 6220 East Schaaf Road, Cleveland 31, Ohio. Bulletin on the Cleveland Automatic Classifying System that consists of the basic gaging, amplifier and relay components

used in automatic part gaging and sorting equipment. It is for use by manufacturers of automatic gaging or machine control equipment or companies who prefer to build their own automation devices.

For more data circle 38 on Postpaid Card



## Die Springs—CHROME VANADIUM STEEL

Fine quality die springs carried in stock—wide selection of hole and rod sizes, lengths and deflections. Three pressure ranges—medium, medium-heavy, heavy. Long life reduces downtime.



Write for free list of stock sizes, prices, and name of nearest distributor.

For more data circle 445 on Postpaid Card



**Raymond  
Manufacturing  
Division**

Associated Spring  
Corporation  
Corry, Pennsylvania

### Recessing Tools

Maxwell Industries, Inc., 493 East Fifth Ave., Ash-tabula, Ohio. Data File AT-61, which is a six page recessing tool data file, will assist production engineers, machine tool designers, machine shop owners and production personnel in solving precision internal machining problems.

For more data circle 40 on Postpaid Card

#### **Automatic Screwdriving System**

Clyde Engineering and Manufacturing Corp., Madison Heights, Mich. Four page color brochure tells how you can save 60 percent or more on your fastener assembly operations with the Tru-Tork Automatic Screwdriving System, which provides positive, accurate metering of screws, rivets, studs or pins, and is adaptable to all makes of power tools. For more data circle 41 on Postpaid Card

#### **Molybdenum Mill Products**

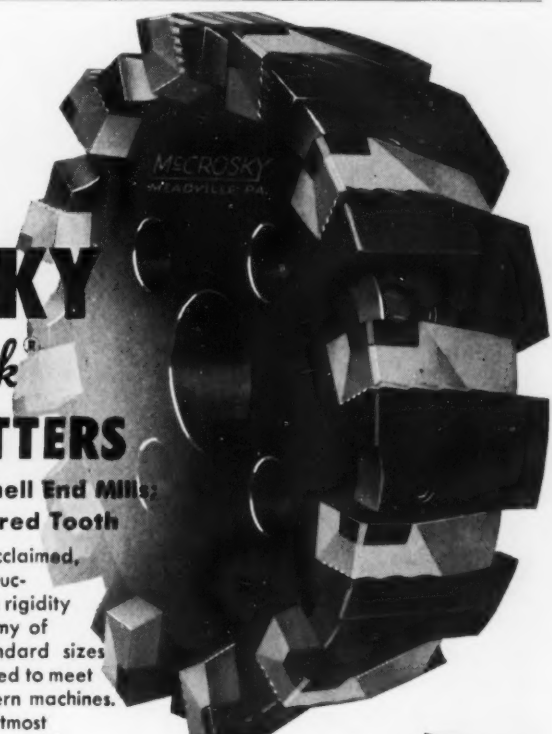
Universal-Cyclops Steel Corp., Refractomet Division, Bridgeville, Pa. Booklet

covers unalloyed molybdenum and Mo-0.5 Ti alloy billets, bars, plates and sheets. Material specs for each of these standard mill products include: scope, manufacture, chemical composition, structure, mechanical properties, dimensions, finish, inspection and other data.

For more data circle 42 on Postpaid Card

#### **Measuring and Recording Instrument**

Micrometrical Manufacturing Co., 345 South Main St., Ann Arbor 7, Mich. Four page color bulletin presents the Proficorder, which is an instrument for measuring and recording surface pro-



# **McCROSKY**

## *Jack-Lock*

# **MILLING CUTTERS**

**Face Mills; Shank and Shell End Mills;  
Half Side and Staggered Tooth**

● Featuring our nationally acclaimed, shop-proved Jack-Lock construction, these cutters combine the rigidity of solid tools and the economy of inserted blade design. Standard sizes from 3" to 24" dia. Engineered to meet the power potential of modern machines. For lowest cutting costs and utmost performance, specify "McCrosky"!

Send for Bulletin No. 18-M Today. It gives full details. ▶

# **McCROSKY**

**TOOL CORPORATION**  
MEADVILLE, PA.



Engineering and Sales Representatives in the Principal Cities  
For more data circle 446 on Postpaid Card



**free literature . . .**

files. It gives true surface profile, records flaws, provides permanent chart record, records waviness, roughness, combination of both.

For more data circle 43 on Postpaid Card

**Abrasive Compound**

The Carborundum Co., Post Office Box 337, Niagara Falls, N. Y. New folder on Carbo-Latex P5 describes a new synthetic latex abrasive compound for safety anti-skid floors, stair treads, side-

walks, highways and airstrips. Developed jointly by Carborundum and The Firestone Tire and Rubber Company, P-5 has excellent affinity to concrete, asphalt, sealed wood, steel and other foot and vehicle traffic surfaces.

For more data circle 44 on Postpaid Card

**Flame Spraying Processes**

Metallizing Engineering Co., Inc., 1177 Prospect Ave., Westbury, Long Island, N. Y. A new 16 page engineering data bulletin on basic flame spray processes covers the metallizing process which sprays powdered metals, including tungsten carbide and self-fluxing alloys of the boron-silicone, nickel, chromium type and refractory ceramics, and the Metco Plasma Flame Spray Process which develops temperatures up to 30,000 degrees F. and can spray any material that can be melted without decomposition.

For more data circle 45 on Postpaid Card

**Bearing Units**

Browning Manufacturing Co., Maysville, Ky. Catalog BU-103 includes data on pillow blocks, flange blocks and take-up units. The catalog is complete with specifications, comparison charts and load rating charts.

For more data circle 46 on Postpaid Card

**Tracer Mills**

Famco Machine Co., Kenosha 2, Wis. New eight page catalog graphically illustrates the great variety of work that can be done and the versatility of Famco Tracer Mills.

For more data circle 47 on Postpaid Card

... *the Quality Line*

**STEEL**  
**Stanho**  
**PRODUCTS**

*Stainless Steel*  
**TAPER PINS**

Complete stock, all sizes #7/0 through #14.  
Special sizes to order.  
Milled or Centerless Ground (Precision Type).  
Made to accurate tolerances.

Also "Stanho" Taper Pins made from selected screw stock, Monel, Brass, Aluminum or other metals. Clean bright finish—prompt shipments.

Write for description and prices.

JM-6

**STANDARD**  
Since 1872  
**HORSE NAIL CORP**  
NEW BRIGHTON, PA

For more data circle 447 on Postpaid Card

#### Precision Chuck

PowerGrip, Inc., Rockfall, Conn. Flyer on a versatile precision chuck. With it you can hold inside or outside surface with the same chuck, change from chuck to collets in minutes, use your present collet closer to operate.

For more data circle 48 on Postpaid Card

#### Tapping and Drilling Heads

Ettec Tool and Machine Co., Inc., 598 Johnson Ave., Brooklyn 37, N. Y. A comprehensive new catalog of "Knuckle-head" universal ball joint adjustable spindle tapping and drilling heads describes the five available models, which will convert any drill press into a high production, multiple drilling and tapping machine.

For more data circle 49 on Postpaid Card

#### Cylinders

The Sheffer Corp., 320 West Wyoming Ave., Cincinnati 15, Ohio. Bulletin No. 458 presents a new lightweight, extra compact, solenoid operated 1½ inch bore cylinder, designed for air, oil or water operation, which is ideal for tooling and automation.

For more data circle 50 on Postpaid Card

#### Duplex Grinder

Hammond Machinery Builders, Inc., 1615 Douglas Ave., Kalamazoo 54, Mich. Bulletin 242 on the SCE-10 Oscillating Electrolytic Duplex, which provides 80 to 90 percent reduction of diamond usage, elimination of heat cracked tools, grinding of two carbide tools at once and automatic, pushbutton operation.

For more data circle 51 on Postpaid Card

#### Stock Reels

Durant Tool Co., 17 Thurburn Ave., Providence 5, R. I. Fully illustrated and detailed, this new catalog features dimensions, capacities, specifications and prices on eight Durant automatic and motor driven stock reels for all coil handling applications.

For more data circle 52 on Postpaid Card

#### Diamond Grinding Wheels

Simonds Abrasive Co., Tacony and Fraley Sts., Philadelphia 37, Pa. Illustrated Form ESA-310 describes diamond grinding wheels, featuring both man-



cool, tough  
Stuart's **DASCO**  
**SUPER-SOLUBLE BASE**  
water-mix cutting fluid



A sulpho-chlorinated fatty oil water-mix base with the cooling capacity of water—for the tough jobs. That's Dasco Super Soluble! Excellent antiweld and lubricating qualities. Can be used at 100:1 for grinding or 15:1 for work that is often performed with a straight oil.

**D. A. STUART OIL CO., LIMITED**

2727 South Troy Street, Chicago 23, Illinois  
Canadian D. A. Stuart Oil Co., Limited, P. O. Box 430,  
43 Upton Road, Scarborough, Ontario, Canada

Water-Mix Cutting Fluids: Dasco Super Soluble • Hi-D • Codol • Solvol  
For more data circle 448 on Postpaid Card

### free literature . . .

made and natural diamonds. Grain and grade recommendations, operating data and illustrations of all standard shapes are included.

For more data circle 53 on Postpaid Card

#### Thread Rolling Heads

Landis Machine Co., Waynesboro, Pa. Bulletin F-99-3 includes the No. 3½ Thread Rolling Head, having a N.C. and N.F. range from 7/16 to ¾ inch. Bulletin contains detailed information

pertaining exclusively to the design and operating features of these heads, along with illustrations and specifications.

For more data circle 54 on Postpaid Card

#### Turret Indexing Unit

Swanson-Erie Corp., 816 East Eighth St., Erie, Pa. Descriptive bulletin on Series J Miniature Turret Indexing Unit. Designed to provide accurate, silent and smooth intermittent motion for high volume assembly and processing jobs, the new unit may be used for semi-automatic bench operations, as the chassis for small automatic machines or it may also be employed as an auxiliary turret of larger automatic machines.

For more data circle 55 on Postpaid Card

#### Abrasives

Weldon Roberts Rubber Co., Brightboy Industrial Division, 95 North 13th St., Newark 7, N. J. This catalog is a comprehensive resume of rubber bonded abrasives: methods and applications, binders, grains and textures and stock sizes.

For more data circle 56 on Postpaid Card

#### Cap Screws

Set Screw and Manufacturing Co., Bartlett, Ill. A new cap screw bulletin gives complete specifications, dimensions and data on the 1960 cap screw series. Bulletin illustrates and describes the advantages and features of the series and includes a forthright comparison of the dimensions of both the new series and the old.

For more data circle 57 on Postpaid Card



## Snap-on Torque Driver

FOR AVIATION —  
ELECTRONICS — RADIO  
TELEVISION — RADAR  
...ANY PRECISION  
ASSEMBLY WORK

SNAP-ON torque driver tightens screws or nuts to exact tensions. Unit is extremely accurate, regardless of position or manner of holding. Easy-to-read dial is calibrated in inches and inch-pounds.

THREE MODELS — capacities 3 in-lb and 48 in-oz;  
6 in-lb and 96 in-oz; 12 in-lb and 192 in-oz. Get full  
details from your SNAP-ON representative.

FOR ALL INDUSTRY  
**SNAP-ON TOOLS**

8109-E 28th Avenue • Kenosha, Wisconsin

For more data circle 449 on Postpaid Card



#### Carbide Brazed Tools

Wesson Co., 1220 Woodward Heights Boulevard, Ferndale 20, Mich. New 36 page booklet, Bulletin No. MF-260, describes standard lines of carbide throw away and "on-end" inserts, blanks and brazed single point tools. Complete specs are given on square, round, triangular and diamond shaped throw away and on-end inserts.

For more data circle 58 on Postpaid Card

#### Tapping and Drilling Machines

Beckett-Harcum Co., Inc., 985 West Locust St., Wilmington, Ohio. Catalog FM-60 is an eight page color bulletin concerning air and hydraulic powered drill press feeds and air powered tapping and drilling machines.

For more data circle 59 on Postpaid Card

#### Power Tools

Skil Corp., 5033 Elston Ave., Chicago 30, Ill. The complete 1960 line of Skil Power Tools and accessories is described in two catalogs. One covers Skil Industrial - Automotive Tools and the other covers the "500" line of power tools for the do - it - yourself and hobbyist.

For more data circle 60 on Postpaid Card

#### Air Tools

Master Power Corp., Box 269, Krick Road, Bedford, Ohio. Catalog G-60 is entitled "Metal Finishing with Master Power Air Tools." Described and illustrated are the company's complete line of grinders, sanders and wire brushing tools.

For more data circle 61 on Postpaid Card


#### Spade Drilling

Madison Industries, Inc., Post Office Box 1137, Providence, R. I. Section 10 shows how one pass spade drilling with replaceable cutters gives uninterrupted production, reduces tool cost and eliminates progressive drilling.

For more data circle 62 on Postpaid Card

#### Universal Machine

Wisconsin Drill Head Co., 4983 North 124th St., Butler, Wis. Bulletin No. 560 fully describes and illustrates the Wis-Matic, which is a drilling, tapping, boring, reaming and spotfacing machine



low friction • high finish

Stuart's **CODOL**

liquid grinding compound



*Codol's balanced lubricating and cleaning action provides a high surface finish without use of extremely fine grit wheels. Fine oil particle size results in a near-transparent solution. No machine maintenance or cleaning problems.*

**D. A. STUART OIL CO., LIMITED**

2727 South Troy Street, Chicago 23, Illinois  
Canadian D. A. Stuart Oil Co., Limited, P. O. Box 430,  
43 Upton Road, Scarborough, Ontario, Canada

Water Mix Cutting Fluids: Codol • Hi-D • Solvol • Dasco Super Soluble

For more data circle 450 on Postpaid Card

## free literature . . .

that will perform operations on as many as five sides of a piece part in one work cycle.

For more data circle 63 on Postpaid Card

### Lease Plan

Jones and Lamson Machine Co., 520 Clinton St., Springfield, Vt. Simple brochure describes a new approach to leasing arrangements for machine tools. Significant features are that there are no security deposits or down payments

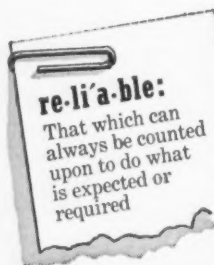
of any kind, finance charges are at low bank rates and lease payments do not begin until 30 days after the shipment has been made.

For more data circle 64 on Postpaid Card

### Auto-Collimator

Engis Equipment Co., 431 South Dearborn St., Chicago 5, Ill. Folder on the company's Auto-Collimator, which is a basic unit designed for universal optical tooling. Other units include the Micro-Alignment Telescope, Microptic Precision Clinometer, Microptic Theodolite and the Auto-Set Level. A listing of technical papers, books, reprints and manuals, available from Engis Equipment Company is given.

For more data circle 65 on Postpaid Card



## CRATEX RUBBERIZED ABRASIVES

*Micro-deburring, Smoothing,  
Cleaning, Polishing*

**Cratex reliability lowers costs**

You can count on every Cratex item to perform just as you expect it to—exactly as the last one did and as the next one will. This is the key to efficiency in micro-deburring, smoothing, cleaning and polishing. **YOU SAVE TIME** because you know just what to expect in performance without experimenting or compensating. **YOU SAVE REJECTS** because with Cratex no unexpected irregularities occur to spoil work pieces.

**WHEELS • POINTS • BLOCKS • STICKS • CONES**  
in 4 grit textures for power or manual application. Sold through leading industrial supply distributors.

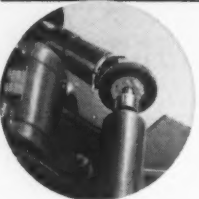
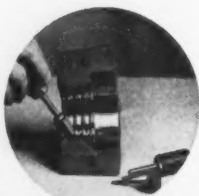
**FREE!** Send for the complete **CRATEX** Industrial Catalog today

## CRATEX

MANUFACTURING COMPANY, INC.

1600 Rollins Road

Burlingame, California



### Screwdriver

Ingersoll-Rand, 11 Broadway, New York 4, N. Y. The story of a machine that not only drives screws, but drives them automatically and quickly in 1½ seconds. The machine is called the R-A-F Screwdriver, because it has been designed to give the latest in Rapid Automatic Fastening.

For more data circle 66 on Postpaid Card

### Motors and Relays

Barber-Colman Co., 44 Loomis St., Rockford, Ill. New four page folder illustrates and gives typical specifications on complete line of a.c. and d.c. fractional horsepower motors, tachometer generators and ultra sensitive relays. It lists rated horsepower, dimensions, special features and typical applications of motors and relays.

For more data circle 67 on Postpaid Card

For more data circle 451 on Postpaid Card

#### Deep Hole Drills

Pratt and Whitney Co., Inc., 25 Charter Oak Boulevard, West Hartford, Conn. Four page color brochure on deep hole drills for long, accurate, super-finished holes in any kind of material—from soft metals to space age alloys.

For more data circle 68 on Postpaid Card

#### Cutting and Grinding Compounds

Park Chemical Co., 8074 Military Ave., Detroit 4, Mich. Folder gives a brief description of the company's cutting and grinding compounds, designed for the metal-working industry. Included are Kem Grind, Kem Cut, Blue Ice, Spray Ice and Polar Ice.

For more data circle 69 on Postpaid Card

#### Boring Mills

Farrel - Birmingham Co., Inc., Consolidated Machine Tool Division, 565 Blossom Road, Rochester 10, N. Y. New 42 page bulletin describes and illustrates the company's complete line of Farrel-Betts Vertical Boring Mills, ranging in capacities from a swing of 7 to 42 feet and larger.

For more data circle 70 on Postpaid Card

#### Machine Cleaner

Cincinnati Milling Machine Co., Cincinnati Milling Products Division, Cincinnati 9, Ohio. A new brochure which is entitled, "Cimcool Machine Cleaner" (PC-355) describes the features of this product and tells how it may be used. It outlines how Cimcool Machine Cleaner can be used as a degreasing solution.

For more data circle 71 on Postpaid Card

#### End Cutting Tools

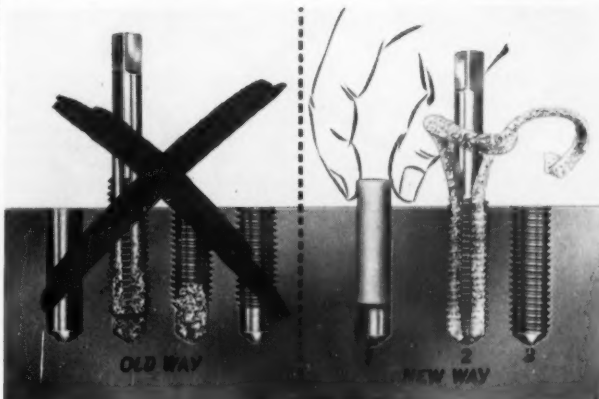
Metal Cutting Tools, Inc., Rockford, Ill. Flyer shows how, with special Metcut End Cutting Tools, you get less chatter, better finish and longer tool life. The "Taper Torque Drive" design provides greater strength and rigidity, maintains accurate alignment.

For more data circle 72 on Postpaid Card

#### Specialty Steel Products

Crucible Steel Company of America, Department TA-4, Post Office Box 2518,

## Chip problems eliminated when you tap blind holes with new TAP CARTRIDGES



Pictured on right shows (1) a tap cartridge (wax pellet) dropped into drilled hole. As tap works into hole (2) solid flow of wax carries chips along and out flutes as fast as chips are made. Bottom of hole is clean when taps get there. Result (3) a clean accurate hole.

- Tap to bottom of hole in one pass.
- Tap cleans itself on next hole.
- Eliminates rejects, torn threads, oversized holes.
- Extends tap life 3 to 5 times.
- No allowance for chip room.
- Obtain a smoother, more uniform thread.
- Can be used in steel, iron, aluminum, plastics and the newer exotic metals.

For FREE SAMPLES give tap size, threads per inch, depth of drilled hole. Sizes 0-80 thru 1 1/4". Write or phone today.

**THE TAP CARTRIDGE CO. P. O. BOX 1617-S**

JUniper 1-7511

**CINCINNATI 1, OHIO**

For more data circle 452 on Postpaid Card

## free literature . . .

Pittsburgh 30, Pa. Catalog and descriptions of literature, technical aids and data sheets, published by Crucible, for better production and utilization of specialty steel products.  
**For more data circle 73 on Postpaid Card**

### Hardness Conversion

The Babcock and Wilcox Co., Tubular Products Division, Beaver Falls, Pa. Chart shows the approximate relation between hardness by various testing systems and tensile strength of carbon and alloy steels. Hardness systems cov-

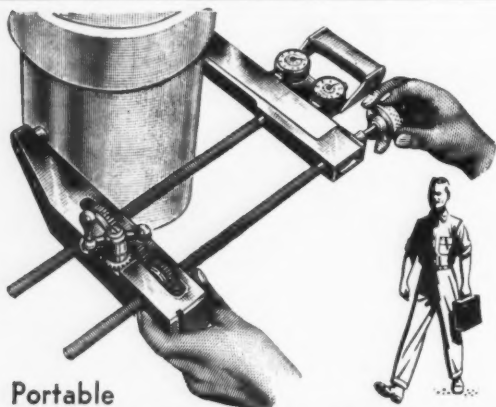
ered are Brinell, Monotron, Vickers, Rockwell and Scleroscope.  
**For more data circle 74 on Postpaid Card**

### Furnaces

Lindberg Engineering Co., 2450 West Hubbard St., Chicago 12, Ill. Bulletin No. 260 describes and illustrates the Lindberg Full Muffle Hydrogen Atmosphere Hand Pusher Furnaces for bright hardening and annealing of stainless steels and other high alloy materials.  
**For more data circle 75 on Postpaid Card**

### Marine Hydraulic Components

American Brake Shoe Co., Denison Engineering Division, 1254 Dublin Road, Columbus 16, Ohio. New 12 page brochure on specially designed marine hydraulic components and their uses. It outlines the use of hydraulic pumps, motors and valves for commercial and military marine use.  
**For more data circle 76 on Postpaid Card**



Portable

## HARDNESS TESTER

gives "on the spot" Rockwell readings

Test materials, tools, or pieces in production "right there, right now!" Save the work of taking samples to the test bench, save the cost of sectioning, eliminate errors due to need for conversion of other scales to Rockwell hardness numbers. Large dial markings are in standard red and black for quick identification of Rockwell scales, A, B, C, D, E, F, G, H and K—all available as standard. Uses standard indentors, loads—no scale conversions required.

FOR A DEMONSTRATION, WRITE Dept. MM-560

# Riehle®

## TESTING MACHINES

A DIVISION OF

### American Machine and Metals, Inc.

EAST MOLINE, ILLINOIS

For more data circle 453 on Postpaid Card

### Lifting Magnets

Stearns Magnetic Products, 635 South 28th St., Milwaukee 46, Wis. Bulletin No. 3021 describes a new line of "Pow-R-Light" Lifting Magnets, designed specifically for scrap handling. These magnets are available in 36, 39, 45, 55 and 66 inch diameters.  
**For more data circle 77 on Postpaid Card**

### Socket Screw Items

Standard Pressed Steel Co., Box 556, Jenkintown, Pa. A new technical reference on industrial socket screws is an illustrated, 82 page textbook which includes both standard catalog data and

extensive design and performance information on a family of fasteners used in virtually all industries.

For more data circle 78 on Postpaid Card

#### Welding Electrodes

Hobart Brothers Co., Troy, Ohio. Comprehensive welding electrode catalog covers the manufacturer's complete line of welding electrodes, gas welding rod, non-consumable electrodes, submerged arc welding flux and automatic welding wire.

For more data circle 79 on Postpaid Card

#### Automation Tools

Buckeye Tools Corp., Post Office Box 966, Dayton 1, Ohio. "A Low Cost Approach to Automatic Drilling, Tapping and Fastening Operations" is the billing for this eight page brochure on the Buckeye line of linear-motion-plus-rotation 21K and 21L automation tools.

For more data circle 80 on Postpaid Card

#### Perforating Units

Tool Products Corp., 377 Old Falls Boulevard, North Tonawanda, N. Y. Catalog No. U-95 describes Series HD Unitized Tooling for the metal fabricating industry. This is a rugged line of perforating units for mild steel up to a maximum of  $\frac{1}{4}$  inch in thickness.

For more data circle 81 on Postpaid Card

#### Milling Cutters

The OK Tool Co., Inc., 800 Elm St., Milford, N. H. A new eight page pictorial brochure features milling cutters, single and multi-point tools and accessories. Shown and described are plain mills, side mills, end mills, hollow mills, form cutters, counterbores, core drills and reamers, special multi-diam tools, face mills, single-point tools and related products such as drive collars, special arbors, micrometric spacers and the Wickman Carbide Impregnator.

For more data circle 82 on Postpaid Card

#### Lighting Equipment

Swing-O-Lite, Inc., 13 Moonachie Road, Hackensack, N. J. Folder on "The Inspector," which is a lamp with a built-in magnifier. It was designed for precision work and features a 5 inch diameter magnifying glass with a powerful 13 inch focus, surrounded by a 22 watt shadow-free fluorescent tube. A custom engineered arm permits complete directional mobility and special adjustment knobs insure the proper tension and steadiness for any desired position.

For more data circle 83 on Postpaid Card

## PALMGREN Machine Vises and Rotary Tables

There are 64 different models and types of Palmgren vises, rotary tables, milling attachments and other machine tool accessories—the most complete line of vises and tables available anywhere.



No. 84  
8"

TILTING, INDEXING  
and ROTARY TABLE \$13950



No. 60B 6"  
SWIVEL MACHINE VISE \$9995

Used in all industries—everywhere.

Get this FREE  
Catalog NOW



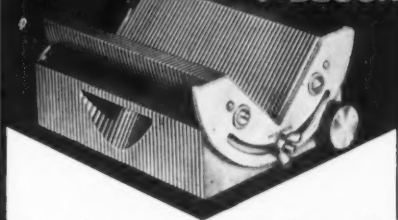
No. 2B 4"  
HEAVY DUTY  
ANGLE VISE  
\$14995



CHICAGO TOOL AND ENGINEERING CO.  
8399 S. Chicago Ave., Chicago 17, Ill.

For more data circle 454 on Postpaid Card

## MAGNETIC ADJUSTABLE V-BLOCK



This unique precision workholder permits quick and accurate setups, saving time, effort and money in grinding operations.

Unsurpassed for layout, toolroom and production. Can be used on any machine equipped with magnetic chucks.

#### COMPARE THESE DISTINCTIVE FEATURES:

- Parallelism:  $\pm .00005$ " over entire length
- Maximum setting: 90° angle
- Vernier accuracy:  $\pm 15$  seconds
- Size: 6" long, 4 1/2" wide, 2 1/2" high

Write today for complete technical data to:

**ANTON MACHINE WORKS**  
1226 Flushing Ave., Bklyn. 37, N. Y.

For more data circle 455 on Postpaid Card

MODERN MACHINE SHOP 205

# NEWS

## of the industry

**Company expansions and acquisitions . . .  
new divisions . . . officers . . . appointments.**

Edited by L. L. BALDHOFF

### **ADAMAS CARBIDE BREAKS GROUND FOR NEW PLANT ADDITION**

Ground for a new plant addition to the present Adamas Carbide Corporation facility in Kenilworth, New Jersey, was broken recently by its president, Edward L. Dreyer.

The new addition will be located on property immediately adjacent to the present million dollar plant, erected in 1954. The existing plant, especially designed and built to facilitate proposed expansion plans, received a spe-

cial citation for achievement in factory design, the McGraw-Hill "Most Significant Plant Award" in 1955.

The single story structure will have a masonry exterior to match the facade of the present building. The new addition will be specifically devoted to the production of tungsten carbide tools, tool tips, dies, wear parts, toolholders and powders. Its new manufacturing facilities will more than double present plant production and enable Adamas to increase the scope of its products. It will also contain a new



Shown in the above illustration is the award winning Adamas Carbide Corporation plant, which was completed during 1954. The new plant addition will be constructed on the east side of this building, adjoining the Garden State Parkway in Kenilworth, New Jersey.



machine shop for the production of molds, jigs and fixtures; a new metallography laboratory, furnished with the latest spectro- and photo-micrographic equipment for continuous product testing and quality control; a new powder preparation room with dust locks to insure "snow white" (dust free) powder operations; and expanded shipping and receiving facilities. Like the present plant, the new unit will be air conditioned with controlled humidity.

★ modern machine shop ★

### PANGBORN FORMS VIBRATORY FINISHING DIVISION

Pangborn Corp., Hagerstown, Md., manufacturer of blast cleaning, abrasive and dust control equipment, has established a Vibratory Finishing Division.

The new corporate division, located at the company's Hagerstown head-

quarters, is headed by William E. Brandt, who has been appointed a Pangborn division manager. Mr. Brandt is a widely known authority on precision finishing.

To launch its new division, Pangborn Corporation has designed a new line of finishing machines and will soon announce details on features said to effect significant improvements. All of the Pangborn Machines are based upon the principle of air cushioned vibration.

In addition, the company is now marketing a full line of precision barrel finishing and vibratory finishing media and compounds.

★ modern machine shop ★

### CASSON ELECTED VICE PRESIDENT NATIONAL ACME

Stanley E. Casson, director of sales of The National Acme Company, Cleveland, Ohio, was elected vice pres-

## !NEW! QUICK-ACTING HAND KNOBS

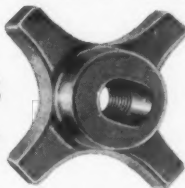


CATALOG INSERT

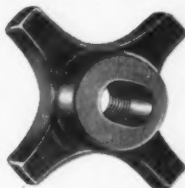
NEW 16 PAGE  
CATALOG

CATALOG  
INCLUDES  
TRACING  
TEMPLATES

**FREE! —WRITE TODAY—**



ALUMINUM



CAST IRON

### JIG AND FIXTURE COMPONENTS

Latch Bolts  
Cast Iron Hand Knobs  
Aluminum Hand Knobs  
Quarter Turn Screws  
Shoulder Screws

Jig Feet (3 Types)  
Spherical Washers  
Fixture Keys  
Knurled Head Screws  
Toggle Shoe Clamps & V-Pads

### HOLD DOWN AND CLAMPING TOOLS

T-Nut & Stud Sets  
Step Block & Clamp Sets  
Flanged Nuts  
Cut Thread Studs

Tee Nuts  
Coupling Nuts  
Adjustable Step Blocks  
Strap Clamps (Plain & Step Type)



*Northwestern*

119 HOLLIER AVE.,

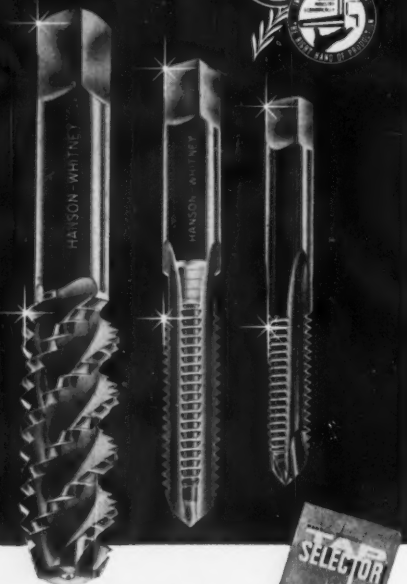
DAYTON 3, OHIO



For more data circle 456 on Postpaid Card

**DON'T PAMPER THESE TAPS**

*....they can take it!*



Hanson-Whitney has now standardized its line of Taps for "off-the-shelf" selection with all types and sizes measuring up to the most exacting requirements.

These Taps can be used at high speed operation on the difficult modern metals required in today's production.

H-W products are stocked by leading Distributors, with Technical Engineering Service readily available.

Write for the NEW Hanson-Whitney Tap Selector showing how to quickly make the proper tap selection. It's free!

## THE Hanson-Whitney COMPANY

269 BARTHOLOMEW AVENUE • HARTFORD 2, CONNECTICUT

TAPS • GAGES • COMPARATORS • HOBS • CUTTERS

THE HANSON-WHITNEY COMPANY  
269 Bartholomew Avenue, Hartford, Connecticut

Please send me the new TAP SELECTOR.  
It's free.

Name \_\_\_\_\_ Title \_\_\_\_\_

Company \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ State \_\_\_\_\_

### news of the industry . . .

ident-sales at the company's annual meeting. Mr. Casson has been associated with National Acme for twenty-five years, twenty-three of which were spent as the company's Detroit district sales manager. Prior to joining National Acme, Mr. Casson served as assistant factory manager of Brown McLaren Manufacturing Company, chief engineer of the Detroit Screw Works, superintendent of the Automatic Screw Machine Department of Ford Motor, and as an instructor in the Henry Ford Trade School.

★ modern machine shop ★

### PUNCH PRODUCTS CORPORATION MOVES

Punch Products Corporation, designers and manufacturers of Unitized Hole Punching and Notching Equipment, recently announced a change of address to 370 Babcock Street, Buffalo 6, New York.

★ modern machine shop ★

### MOTCH AND MERRYWEATHER NAMED SALES AGENT FOR TAFT-PEIRCE

The Allied Products Division of The Motch and Merryweather Machinery Company has been appointed exclusive sales agent for The Taft-Peirce Manufacturing Company, Woonsocket, Rhode Island.

Operating from its offices at 875 Greentree Road in Pittsburgh and at 1250 East 222nd Street in Cleveland, Motch and Merryweather will sell products of the Taft-Peirce Small Tool and Gage Divisions throughout Eastern Ohio, Western Pennsylvania and the entire State of West Virginia.

Taft-Peirce manufactures setup, production and quality control equipment for the metalworking industry.

←For more data circle 457 on Postpaid Card

## W. A. JOHNSON HEADS R-O MANUFACTURING COMPANY

William A. Johnson has been elected president and Elwood Hemlin, vice president of R-O Manufacturing Co., 31171 Stephenson Highway, Madison Heights, Michigan.

The firm has a contract for exclusive manufacturing and sales rights for R-O Universal Form Relieving Fixtures, grinders and attachments. A new plant of 10,000 square feet has been built on Stephenson Highway for the production of the equipment used in form relief sharpening of cutting tools and other toolroom grinding operations in the metal-working industry.

R-O equipped shops desiring to add the recently announced R-O Comparator, can exchange present grinder bases for new ones on which the comparator can be mounted. The exchange plan not only enables



William A. Johnson

owners to replace equipment on which lead screws and other parts have undergone normal wear, but it also provides up-to-date equipment.

The R-O Exchange Plan is designed for the equipment owner's convenience. After ordering, the customer retains his present equipment for use until the new R-O comparator and grinder arrive. When the equipment is received, he removes the motor column from his present grinder and installs it on the new one. The old grinder base is then returned.

**THE TRUTH ABOUT... MARSHALL LEADERSHIP**  
SPECIALISTS IN PREPARED TOOL STEELS

LEADERSHIP, like reputation, is earned by striving for perfection and by the consistent delivery of quality-controlled products. "He profits most who serves best".

LEADERSHIP is often copied—but never equaled! Marshall Steel Company makes available the largest stocks of Ground Flat Tool Steel on the market in three types:—

**OILcrat:** A fine grained electric furnace tool steel, oil hardening (S.A.E. 0-1 Tungsten Type) Analysis.

**AIRcrat:** A 5% chromium fine grained electric furnace tool steel, air hardening. This is (S.A.E. type A-2) Analysis.

**MARSHALLCrat:** Low Carbon, silicon killed 1018, high-quality carbon steel. (Can be case-hardened or carburized)

Each of these 3 grades are metallurgically correct for proper heat treating... truly... The ARIS-TOCRATS OF GROUND FLAT STOCK.

We repeat... QUALITY IS OUR WATCH-WORD—MAKE IT YOUR BUYWORD.

If you want to know more about us—Write for latest catalog.

SOLD THROUGH  
SELECTED DISTRIBUTORS

**MARSHALL STEEL COMPANY**  
Box 108-MM, LaGrange, Illinois

Write for colorful Wall Chart FREE upon request  
For more data circle 458 on Postpaid Card

*"Emblem of Excellence"*



## RICE

### MILWAUKEE DIE FILERS

The Complete  
Die-Making Machines  
for all operations . . .

#### FILING — SAWING LAPPING

- Work table tilts 4 ways
- 11", 13" and 18" table sizes
- Choice of 2 or 4 speeds or infinitely variable, 100 to 475
- Improved overarms
- You can dial correct speed and stroke with Model FS-VSS

Send for Bulletins on the complete Rice—Milwaukee line of Die-Filers and Profile Grinders.

**RICE PUMP & MACHINE CO.**  
226 PARK AVE., BELGIUM, WISCONSIN  
In Milwaukee's Great Industrial Area

For more data circle 459 on Postpaid Card

## MUMMERT-DIXON FACINGHEADS

Two-way tool feed in 9, 12, 16, 20, 24, 30, 36, 40 and 46 sizes.

One-way tool feed in 6, 9 and 12 sizes. Automatic feed — convenient tool adjustment — quick feed reverse. Save time and costly set-ups.



Write for  
folder.

**MUMMERT-DIXON CO.**  
120 PHILADELPHIA ST. • HANOVER, PA.

For more data circle 460 on Postpaid Card

210 MODERN MACHINE SHOP

news of the industry . . .

### STANDARD HORSE NAIL ANNOUNCES APPOINTMENT

Kenneth Majors has been appointed manager, customer service department, Standard Horse Nail Corporation, New Brighton, Pennsylvania.

He succeeds Jim Latham who, after seven years of handling service on machine keys, pins, foundry chills and other Stanho steel products, has resigned to become part owner and sales manager of a new FM radio station in Atlanta, Georgia.

★ modern machine shop ★

### HARRINGTON-WILSON-DAUM ANNOUNCES PROMOTIONS

Harrington-Wilson-Daum Corporation, Mount Vernon, New York, has promoted C. Morgan Newbury from district manager to assistant general manager, and Charles B. Tansley to vice president, sales.

Mr. Tansley formerly was president of Bryant Machinery Company, Chicago, Illinois.

John H. Daum, president, stated that these position changes were brought about in order to meet the needs of expanding activity of the company.



C. Morgan Newbury



Charles B. Tansley

May, 1960

## ACME INSTITUTE OF TECHNOLOGY EXPANDS ACTIVITIES

The new owners of the Acme Institute of Technology, Dayton, Ohio, have announced plans for extending school activities to other cities in Ohio. Robert E. Lukens, consulting tool and die design engineer, and H. K. Angell stated that they had purchased what was formerly known as the Acme School of Die Design Engineering, which has been in operation for the past sixteen years, having been started by the late Don B. Showalter.

Mr. Lukens assumes the presidency from Mrs. Showalter, who had succeeded her husband, while Mr. Angell is vice president and director of education. During World War II, Mr. Lukens operated his own tool firm in Dayton and also established a school for training toolmakers.

The institute is now conducting both day and evening classes, as well as a correspondence course, which is particularly adapted to high school graduates.

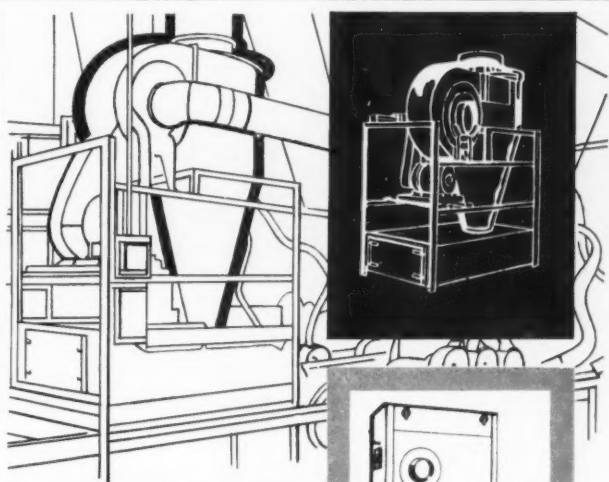
Present courses include industrial mathematics, me-

chanical drawing and tool, die and fixture design engineering. They hope shortly to include a course in machine designing and also one in electronics.

★ modern machine shop ★

## PRATT AND WHITNEY TO SELL THROUGH INDUSTRIAL DISTRIBUTORS

Pratt and Whitney Co. Inc., West Hartford, Conn., manufacturer of pre-



### Custom dust collection —with a standard unit . . .

Regardless of your dust collection problem, chances are there is a space-saving Dustkop model to fit the job. Aget, for years, has led the field in efficient, compact design and has developed more than 50 standard Dustkop collectors. Each is job-tailored to most grinding, buffing or finishing operations—as well as many other types of service. Write for illustrated brochure that helps select your tailored Dustkop unit.

Also a complete line of mist collectors

## AGET

MANUFACTURING COMPANY DUSTKOP

1300 EAST CHURCH ST., ADRIAN, MICHIGAN Stops Dust

For more data circle 461 on Postpaid Card



## Every Shop Should Own One



No distortion —  
even on 1/8" stock!  
MODEL "C"

## KNURLMASTER Hand Knurler



For small production runs on 1/8" to 1" stock. Exclusive screw design gives perfect knurl pattern. Furnished with 3 hardened straight or diamond pattern knurls of standard 1/2" dia. Forged steel frame is self-centering. Write for illustrated folder.

### ROCKWIN MANUFACTURING CO.

800 MAGNOLIA AVE., WESTBURY, L. I., N. Y.

For more data circle 462 on Postpaid Card

save 20 to 30% on new  
**CARBIDE TOOLS**

RICO has a complete line of:

- Quality rotary carbide & HSS tools
- Available for immediate delivery
- Big savings on new tool costs
- Up to 50% savings on regrinds
- Special tools to specifications
- Distributor inquiries invited about better profit margins with RICO TOOLS.



Attach ad to your letterhead for more information.

**RICO TOOL CO.**

5915 DIXIE HWY. • SAGINAW, MICH.

For more data circle 463 on Postpaid Card

## news of the industry . . .

cision machine tools, gages and cutting tools, recently announced plans to make two of its product lines available to customers through selected industrial distributors.

Pratt and Whitney, which celebrates its 100th anniversary this year, has always sold all products on a direct basis, through its own company representatives and branch offices. However, in the very near future, the company's wide line of cutting tools and conventional gages will be sold through local industrial distributors. As in the past, Pratt and Whitney factory-trained representatives will be available to assist distributor salesmen and customers.

★ modern machine shop ★

### NELCO TOOL COMPANY EXPANDS

The Nelco Tool Company, a subsidiary of the Cutting Tool Division, Brown and Sharpe Manufacturing Co., is expanding the manufacturing facilities of its plant in Manchester, Connecticut.

Nelco manufactures carbide tipped milling cutters and end mills and has grown steadily since starting in the carbide cutting tool field 18 years ago.

Increased demand for Nelco Tools has made necessary this manufacturing expansion. The new building addition, finished in early April, will be equal in size to the original Nelco Manchester plant.

★ modern machine shop ★

### INDUSTRIAL PIONEER STILL ACTIVE IN 98TH YEAR

Frederick Van Norman, one of the founders of the Van Norman Machine Co., Springfield, Mass., is beginning his 75th year of association with the com-



pany. "Mr. Fred" celebrated his 97th birthday just prior to the New Year.

Born December 13, 1862, in Hamilton, Ontario, Canada, he moved to Waltham, Mass., 19 years later. Here, with his brothers Edmond and Charles, he founded the forerunner of the present company, known then as the Waltham Watch Tool Company. Four years later, the company was relocated in Springfield and became the Van Norman Machine Tool Company. Prior to his formal retirement from the company in 1955, Mr. Van Norman was chairman of the board. He still maintains a keen interest in the firm he helped develop and is a frequent visitor to the plant. His office, with its roll-top desk, is a center of plant activity during his visits.


In excellent health as he nears the century mark, the patriarch says, "It's great to be alive and see beginning of the space age. It seems that the longer I live, the more exciting the future gets."

★ m m s ★

## STEEL, FILM PREVIEW

Recently at the Pittsburgh Hilton, 31 executives of the Crucible

Steel Company of America entertained over 80 members of the local Pittsburgh area press, radio and TV and editors and publishers of the national technical and business press for a showing of Crucible's new 45 minute color film, "Specialty Steels." The film was planned by Michael Stumm, Director of Information Services, to tell the story of the science and art which goes into producing the special purpose steels, such as stainless steels and tough wear and shock resistant steels



### Self Centering BORE GAGE

WITH SUPER SENSITIVE GAGING HEAD *made by Mahr*

Will Repeat within **50** millionths of an inch

THIS PRECISION INSTRUMENT IS AN  
INEXPENSIVE, ACCURATE AND DEPENDABLE  
**INTERNAL COMPARATOR**  
READING DIRECTLY IN 50 MILLIONTHS OF AN INCH

<b>SMALL BORE GAGES</b>	With interchangeable, springloaded Split Jaw Measuring Heads	
	Range .059" to .160"	\$88.50
	" .160" to .280"	72.50
	" .280" to .400"	72.50
<b>LARGER SIZES</b>	Employing a springloaded bridge, as illustrated	
	Range .400" to .700"	\$72.50
	" .700" to 1.400"	67.50
	" 1.400" to 2.400"	67.50

Complete in Hardwood case, without gaging head. Extra for gaging head reading in .000050" ... \$37.50 which may be interchanged in the various sets. Other heads reading in 20 millionths or .0005" available.

**OTHER SIZES** | Up to 32" in diameter and 88" hole depth  
**BORE GAGES**

**The most COMPLETE Line of BORE GAGES**

- PRECISION COMPARATOR STAND for checking of mass-produced small parts
- RIGHT-ANGLE BORE GAGES for hard-to-measure places.
- Tungsten carbide tipping of extensions and contact points.
- Extensions for deep bores up to 88"


GUARANTEED (Mahr) QUALITY

AT YOUR FAVORITE SUPPLY-HOUSE OR WRITE TO

## MAHR GAGE CO.

274 -MO LAFAYETTE STREET • NEW YORK 12, N. Y.

For more data circle 464 on Postpaid Card



**news of the industry . . .**

for the toolroom. It was produced by the Marshall Organization, Inc., N. Y.

The music, which accompanies the story of specialty steels, is a special performance of the Zurich, Switzerland, Symphony Orchestra and has not been played before in this country. The sequence of stainless steel was photographed at Crucible's large in-

tegrated mill at Midland, Pennsylvania, on the Ohio River, 34 miles west of Pittsburgh. The making of tool steels is shown at the Sanderson-Halcomb Works, Syracuse, New York.

★ modern machine shop ★

**J. W. GILLEN ELECTED DIRECTOR**

James W. Gillen, president and general manager, John Gillen Company, Cicero, Illinois, subsidiary of Standard

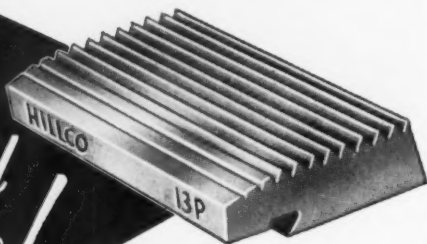
Railway Equipment Manufacturing Company, Chicago, has been elected a director of Standard. Mr. Gillen has served in various posts in the business founded by his father in 1920, including those as general manager from 1939 and president from 1943. The Gillen Company specializes in pinning and keying devices for production assembly of consumer, commercial and industrial products.



James W. Gillen

# "HILLCO" TANGENT CHASERS

*We think you'll agree!*



The new line of "HILLCO" Tangent Chasers, which can be re-ground for 80% of their original length, are guaranteed to be of highest grade tool steels ground to exacting tolerances. We feel that this complete line of chasers are the finest that we have produced in our 75 years of cutting tool manufacture. We think that you will agree with us.



**THE HILL ACME COMPANY**

**ACME MACHINERY DIVISION**

**1203 West 65th Street • Cleveland 2, Ohio**

For more data circle 465 on Postpaid Card

## EX-CELL-O ACQUIRES OPTICAL GAGING PRODUCTS

H. G. Bixby, president of Ex-Cell-O Corp., Detroit, Mich., has announced the acquisition of all of the outstanding capital stock of Optical Gaging Products, Inc., Rochester, New York. The acquisition was effective February 1, 1960, at which time the Rochester company became a wholly-owned subsidiary of Ex-Cell-O. Willis De Boer, president of Optical Gaging Products, will remain as president of the subsidiary.

Optical Gaging Products manufactures standard and custom chart-gages and staging fixtures for optical projectors. The company also manufactures and distributes layout machines and materials. In addition, it is the national sales and service organization for Kodak Contour Projectors.

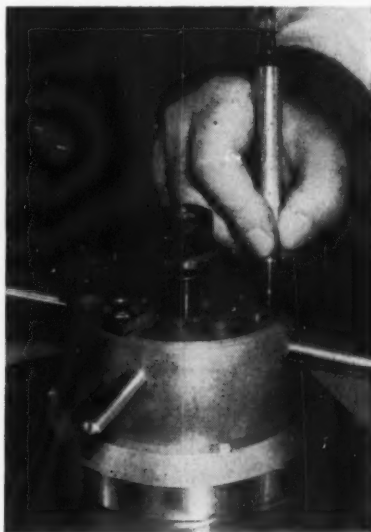
Ex-Cell-O has also arranged to purchase the contour projector business of Eastman Kodak Company, according to a joint announcement by H. G. Bixby and Albert K. Chapman, president of Kodak.

The contour projector is an optical gaging instrument, designed to permit

dimensional inspection of precision parts by projecting an enlarged image of the part on a screen.

According to Messrs. Bixby and Chapman, transfer of the Kodak business to Ex-Cell-O began on February 19, 1960. Under terms of the purchase, Ex-Cell-O will acquire Kodak's inventory of completed projectors, projectors under construction when completed and some production tools. The Detroit firm will also acquire certain patents on the contour projectors.

## NEW ROTOR *Airiter* offered on money-back guarantee



You can buy the new Rotor *Airiter*, try it on your marking jobs for 5 days, then get your money back if it doesn't meet your expectations! Find out how this new marking tool outperforms all others. Its short-stroke carbide stylus makes up to 12,000 blows per minute...finely controlled by a throttle mounted on the tool. The *Airiter* marks parts and tools of all sizes...all materials...easier and faster than any other method. Try it in your shop and see how it writes circles around other methods! Send us your purchase order. Money refunded if, after a 5-day trial, the tool is unsatisfactory. *The Rotor Tool Company, 26329 Lakeland Boulevard, Cleveland 32, Ohio.*

**Only \$49.50**

plus postage

**DEALERSHIPS  
AVAILABLE**

For more data circle 466 on Postpaid Card

**news of the industry . . .**

**LEAKE ROCKER ARM  
ACQUIRED BY  
LAMINATED SHIM**

The rights to manufacture and distribute the Leake Rocker Arm for internal combustion engines have been acquired by the Laminated Shim Company of Glenbrook, Connecticut.

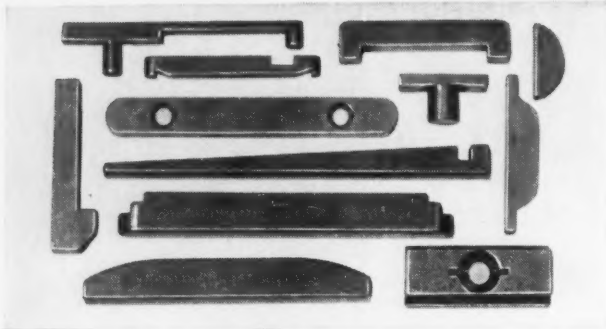
A unique feature of the Leake arm is that it can be stamped successfully

in its finished form from a single piece of steel. Inventor of the stamped rocker arm is James M. Leake, Sr. who, concurrent with the acquisition of the assets of the Leake Engineering Company of Monroe, Michigan, joined the Glenbrook company in a full time engineering capacity. According to A. V. Anderson, president of Laminated Shim Company, one of Leake's primary objectives, in addition to rocker arm design and development, is the redesigning of parts, so that produc-

tion can be converted from relatively complicated methods to simpler stamping techniques.

**Precision Made**

**GILLEN MACHINE  
KEYS AND PARTS**



**Keys to rigid  
tolerances**

completely deburred.  
Gib Head and No Head  
Taper Keys, Straight and  
Round End Feather Keys.  
ready for use.

**Parts in every  
shape and size**

milled, drilled, tapped,  
countersunk, counter-  
bored, heat-treated, sur-  
face ground in many  
metals.

*Blueprints will receive prompt quotations  
Ask for samples by size and type*

**JOHN GILLEN COMPANY**

**Keying and Pinning Devices**

2564 South 50th Avenue • Cicero 50, Illinois

*A subsidiary of Standard Railway Equipment Manufacturing Company*

**For more data circle 467 on Postpaid Card**

★ m m s ★

**BESLY-WELLES  
EXPANDS  
OPERATIONS**

Opening of a new combination warehouse and branch office at 1025 Greeley Ave., Union, New Jersey, has recently been announced by Besly - Welles Corp., South Beloit, Illinois.

The new facilities contain 1,600 square feet of floor space. This area is being used as a branch office and warehouse, stocking the company's complete stock of cutting tools and gages, including taps, X-Press Taps,

drills, reamers, end mills, carbides and toolholders to service the East Coast distributors.

★ modern machine shop ★

### **EXPORT OFFICE ESTABLISHED BY CINCINNATI SUB ZERO PRODUCTS**

A separate office to handle foreign sales and export operations has been established at 224 East Eighth St., Cincinnati, Ohio, according to an announcement by R. J. Jacobson, president of Cincinnati Sub Zero Products.

H. E. Schurgast, who has worked almost exclusively in foreign trade since the close of World War I, has been appointed Export Manager. He is a native of Berlin, Germany, and has been a resident of Cincinnati since 1938.

Cincinnati Sub Zero Products manufactures low temperature production chilling and environmental testing chambers for use in metalworking, research, medicine, agriculture and many other fields.

During its 20 years of business, Cincinnati Sub

Zero has exported many chambers to Canada, Europe and South America. Recently a shipment of special chambers was delivered to India, and currently in manufacture is a large order destined for Brazil.

The new export office is needed to facilitate handling of steadily increasing demands in the foreign markets and is expected to considerably increase the total company business during 1960.



## **Metal Cutting Knives ONLY**

We offer forty years of experience in producing the highest quality Metal Cutting Knives and skilled craftsmen working with the finest materials to exacting tolerances.



*A bulletin on "Metal Shearing Aids" will be sent on request.*

### **THE HILL ACME COMPANY**

CLEVELAND KNIFE DIVISION

1201 West 65th St. • Cleveland 2, Ohio

For more data circle 468 on Postpaid Card

news of the industry . . .

### **BAUSCH AND LOMB ANNOUNCES MILITARY PRODUCTS DIVISION**

Bausch and Lomb Optical Co., Rochester, New York, has announced the organization of a separate Military Products Division, which will work with both the government and prime contractors on the development of

items which are needed for the national defense program.

W. A. Kerr, manager of the new division, outlined the following major objectives of the organization: (1) To establish Bausch and Lomb as a research and manufacturing source for integrated optical-mechanical-electronic systems; (2) To obtain contracts for the manufacture of such systems; and (3) To develop improved optical solutions to problems which

heretofore have been considered solely in the field of electronics.

The Military Products Division is completely divorced from the commercial products divisions. It contains its own sales department, under J. W. Wright; manufacturing, under C. N. Hendershott; and research and engineering, under Dr. L. S. Packer. Each of these departments is responsible to Mr. Kerr who, in turn, reports directly to the president of Bausch and Lomb Optical Company.

Company officials point out that this special organization will result in immediate customer benefits by improving communications and reducing lead time and costs.

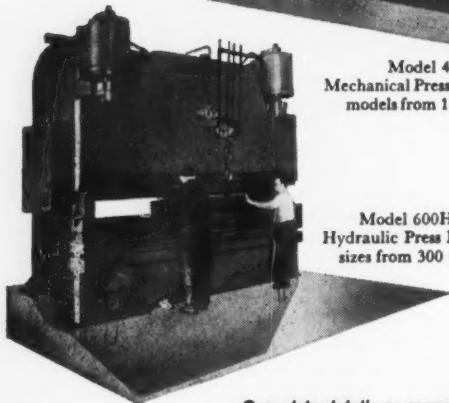
## **CHICAGO® PRESS BRAKES**

**UNEXCELLED ACCURACY**

for sheet metal  
and plate work



Model 410D, 90-Ton CHICAGO Mechanical Press Brake. Other standard models from 11 to 450 ton capacities.



Model 600H10, 600-Ton CHICAGO Hydraulic Press Brake. Other standard sizes from 300 to 2000 ton capacities.

8488

*Complete details or recommendations  
on any press brake work upon request*

Press Brakes  
Press Brake Dies  
Straight-Side-Type Presses  
Hand and Power Bending Brakes  
Special Forming Machines



**DREIS & KRUMP  
MANUFACTURING CO.**

7418 S. Loomis Blvd., Chicago 36, Illinois

For more data circle 469 on Postpaid Card



# No Finer Equipment FOR **MEASURING FLATNESS** EASIER . . . MORE ACCURATELY

## LAPMASTER OPTICAL FLATS

So accurate . . . so easy to get flatness readings down to  $1/10$  of a light band with the Lapmaster line of Optical Flats. Special manufacturing technique and laboratory control assures uniform flats of highest quality.

Available in certified optical accuracies of .000002" or .000001" . . . in either clear fused quartz or Pyrex glass . . . either double or single surfaced . . . in a full range of standard sizes from 1" through 12" dia.



## THE LAPMASTER MONOCHROMATIC LIGHT

There's no easier way to inspect and measure surface flatness. The new Lapmaster Monochromatic Light has a powerful helium lamp (40 candle power) for sharp reading . . . light head is adjustable for best reading angle; can be swung completely around to handle tall parts . . . is easily portable in self-contained carrying case.



**Write for complete details and measurement chart.**



**CRANE PACKING COMPANY**  
6418 OAKTON STREET  
MORTON GROVE, ILLINOIS (Chicago Suburb)  
In Canada:  
Crane Packing Co., Ltd., Hamilton, Ont.

For more data circle 470 on Postpaid Card



# equipment

***Descriptions of new machines, tools  
and materials for metalworking.***

Edited by L. L. BALDHOFF

## **CONTOUR GRINDER HAS TRACER CONTROL WITH AUTOMATIC SWIVELING**

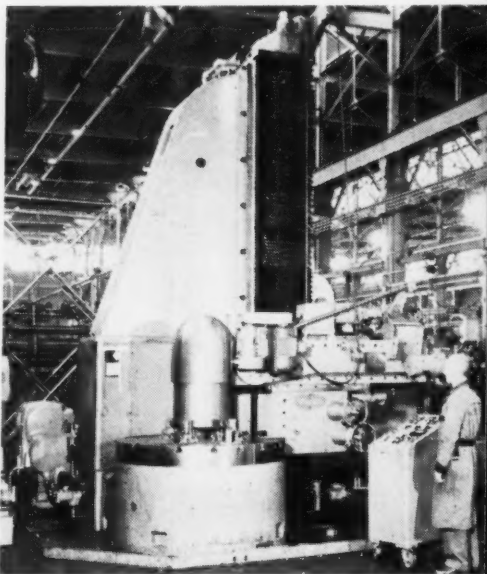
Precise linear and non-linear contours of missile nose cones and other convex surfaces can be accurately produced by a new single head grinder with tracer control and automatic swiveling, which has recently been developed by The Bullard Co., Bridgeport 9, Connecticut.

The first of the new machines—with a 66 inch table and a maximum work height of 8 feet—has been delivered to Avco Corporation, Lycoming Division, Stratford, Connecticut. The design will be developed in other sizes, too, to meet the requirements of individual customers as they arise.

The new Bullard swiveling single head grinding machine utilizes a side-head, instead of a vertical ram type head.

To the largest extent possible, the new design makes use of standard components from comparable sized Bullard Vertical Turret Lathes and Vertical Boring Mills. As a result, its cost has been kept to a remarkably low figure for special machines.

Primarily, this Bullard machine was designed to carry out precision line-



**Figure 1—This overall view of the new Bullard Swiveling Single Head Grinding Machine shows the operator control console.**

# and materials

contact external surface grinding.

By the use of special extended spindles, the machine can also be used for internal grinding, but only to produce a straight surface, not a contoured one.

To make the machine more versatile and thus permit the highest possible degree of utilization, Bullard designed it to be capable also of carrying out precision machining operations. The entire grinding unit, including the drive motor, can easily be removed from its mounting plate, and cutting tools can then be secured to this plate, for precision contour machining, employing the same tracer control and automatic swiveling as in grinding.

A separate toolholder has also been devised which permits the machine to be used for internal boring to a depth of 48 inches, either with a straight vertical cut or a contour cut.

The machine is designed for completely automatic operation, incorporating a standard General Electric two dimensional tracer control plus a specially designed automatic swiveling control. A single template is used to guide the movements of the grinding head. Two separate template-followers with a common axis ride the edge of this template. One controls the horizontal and vertical feed; the

other controls the automatic swiveling mechanism. Following can be in either direction along the template—either clockwise or counterclockwise.

The result of this combination of controls is to keep the surface of the grinding wheel in contact with the work and its face always tangent to the contour of the surface of the work.

The template, on work over 48 inches and up to 96 inches high, can

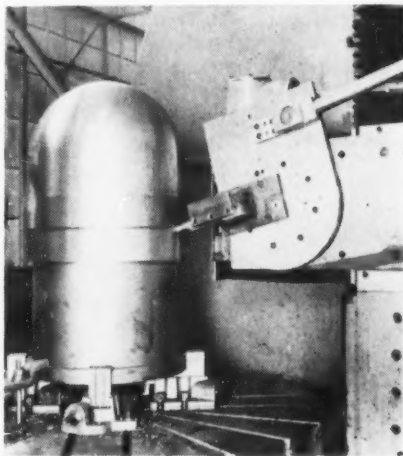


Figure 2—This close-up shows the mounting plate with the grinding wheel removed and toolholder mounted for precision machining.

### **new equipment . . .**

be dropped vertically before each succeeding "pass" to allow for changes in the curvature of the work as grinding progresses. The axis of the two styli which follow the template can be moved horizontally (toward the work) by as much as 2 inches to adjust for grinding wheel wear and reduction in the diameter of the work. On work up to 48 inches high, the template can be easily moved horizontally and vertically to allow for these same changes in work dimensions.

For more data circle 84 on Postpaid Card

★ modern machine shop ★

### **ENGINE AND TRACER LATHE**

A medium duty engine and tracer lathe is introduced by The American Tool Works Co., Cincinnati 2, Ohio.

This Maxi-Swing Lathe has been designed to handle heavy work, up to 40 tons and will make precision cuts to  $\frac{3}{4}$  inch depth. It is available in four sizes with swings from 74 to 108 inches over the bed. The bed is 56 inches wide with four hardened and ground replaceable vee ways. The tracer lathe is completely equipped with carriage

mounted power unit and motor, all hoses and fittings, hydraulic tracer valve, angle tracer slide with hydraulic actuating cylinder, periscope type precision optical viewer, template holder brackets and adjustable supports for flat templates.

This machine is designed for accuracy and convenience of use in steel mill maintenance, shipbuilding and repair, missile and similar types of work in the heavy industries.

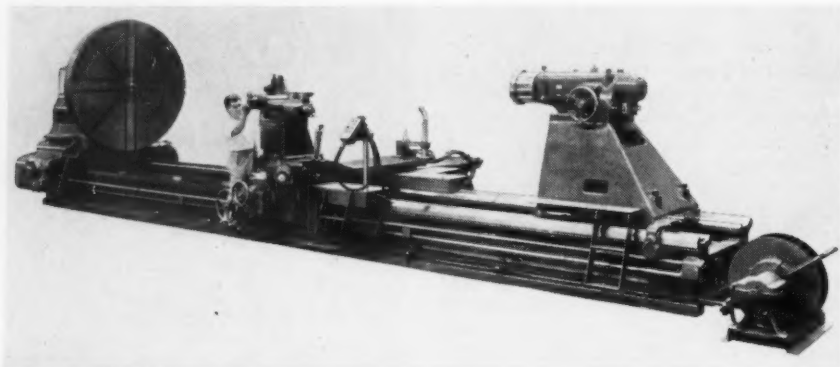
For more data circle 85 on Postpaid Card

★ modern machine shop ★

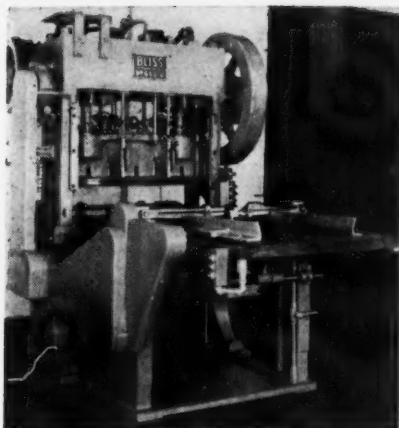
### **MULTIPLE DIE PRESS FOR HIGH SPEED CAP PRODUCTION**

The E. W. Bliss Co., Press Div., 1375 Raff Rd., Southwest, Canton 10, Ohio announces a multiple die press for large quantity production of screw caps, tape cans, shoe polish cans and similar items. An entire lithographed sheet of tin plate or aluminum can be fed to the multiple dies, producing 8, 10 or even more caps at each stroke. Operating speeds range from 100 to 125 strokes per minute.

Built in two sizes, the smaller Model 660D, can produce eight 48 or 53 mm caps at each stroke. The larger Model 6100B produces ten 70 mm caps per



*This American Maxi-Swing Engine and Tracer Lathe will handle work up to 40 tons.*



Multiple Die Press comes in two sizes.

stroke or a correspondingly lower number of larger size caps.

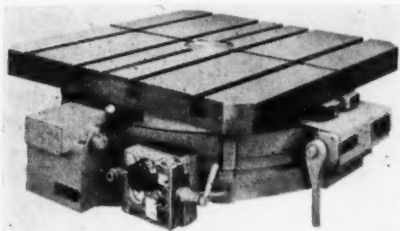
For more data circle 86 on Postpaid Card

★ modern machine shop ★

#### ROTARY TABLES INDEX OFF-CENTER LOADS

A line of Airmist Rotary Tables, which index extra heavy loads even when placed off-center, is announced by Cincinnati Gilbert Machine Tool Co., Cincinnati 23, Ohio.

When these tables are indexed, an air-oil mist lifts the top through specially designed valves in the way surface of the base. This, in effect, "floats" the top on about 0.001 inch



Airmist Table indexes off-center loads.

May, 1960

of mist. The lift is automatically distributed, so an offset load is always supported. The air-oil mist cannot spill out of the relatively unloaded side of the table. In addition, the air-oil mist is said to prevent corrosion from moisture in the lifting air.

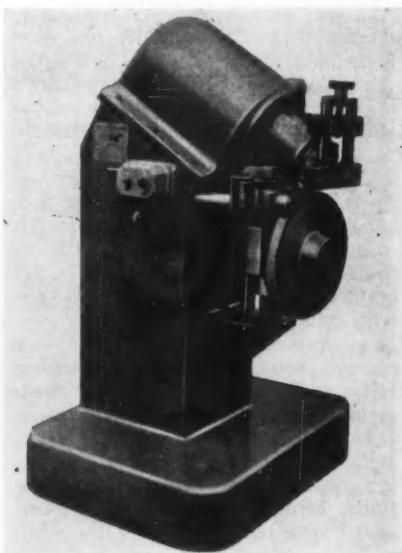
Airmist Tables are available in a broad range of standard sizes, starting at 36 inches round or square. Special sizes may be ordered. They may be used with horizontal boring mills and milling planers. They are also furnished on runways for use with floor type horizontal boring mills.

For more data circle 538 on Postpaid Card

★ modern machine shop ★

#### PLATE BEVELLER

A compact machine in every respect, the Model X-8 Beveller, product of American Pullmax Co., Inc., 2465 North Sheffield Ave., Chicago 14, Ill., cuts a 1/2 inch bevel on mild steel plate



X-8 Pullmax Beveller comes in three models.

MODERN MACHINE SHOP 223

### **new equipment . . .**

(or  $\frac{3}{8}$  inch in stainless) to prepare the seam for a perfect arc weld fillet.

On plate up to 1 inch thick, both sides can be bevelled by turning the plate. The machine was designed to provide a fast, easy, bevelling job on small hand carried pieces for weldments. However, many users bevel larger pieces by using a support table around the front of the machine. Cutting speed with mild steel is approximately 11 feet per minute.

X-8 Bevellers are available in three models to cut 30, 37½ or 45 degree bevels.

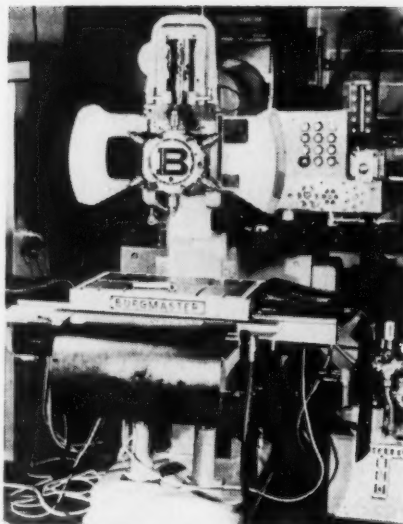
For more data circle 87 on Postpaid Card

★ modern machine shop ★

### **AUTOMATIC TURRET DRILLS DOUBLE RANGE OF SPEED SELECTION**

Burgmaster Corp., 15001 South Figueroa St., Gardena, Calif., announces that, through the use of a four speed motor, Burgmaster Automatic Turret Drills offer a selection of eight individual speeds in any of four speed ranges per each spindle. The new design is available in both the Models 2BH and 3BH, respectively, six and eight spindle turret construction equipped with automatic hydraulic controls. The amplified speed range is also available in the companion tape controlled six and eight spindle models.

The wider range of speed selections for each spindle facilitates operation at the most efficient machining speed—from slow spindle r.p.m.'s required for tapping and for large tools, to high r.p.m.'s best suited for small diameter high speed drilling and boring operations. Finish and accuracy are improved with prolonged tool life, while producing at a higher net production rate. Job planning is simplified when



Machine Control Panel shows new twin spindle speed-cycle control drums, permitting instant selection of any one of eight speeds for each spindle. Selection is simply made by turning knurled knob corresponding to each turret spindle to desired setting. No pick off gears are used and the entire turret setting can be made in a few minutes.

each spindle offers the most efficient speed selection.

For more data circle 88 on Postpaid Card

★ modern machine shop ★

### **MEDIUM CAPACITY ELECTRIC HYDRAULIC PRESSES**

Engineered to handle those tough and heavy duty jobs requiring pressures of 25 and 40 tons, two medium capacity electrically powered hydraulic presses are introduced by ACCO Equipment Div., American Chain & Cable Co., Inc., York, Pennsylvania.

Designed to easily handle, at low capital investment, the wide variety of press work demanded by industry, these units incorporate ease of operation and versatility with built-in

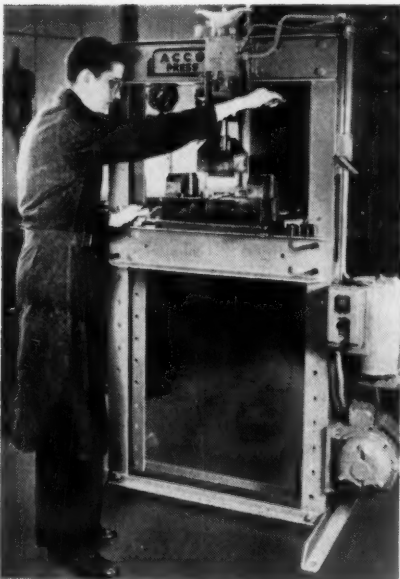


safety and simplicity of maintenance. Frame members are fabricated from selected structural steels for maximum rigidity and minimum deflection. All corners have been coped and ground to eliminate sharp corners and disagreeable contours.

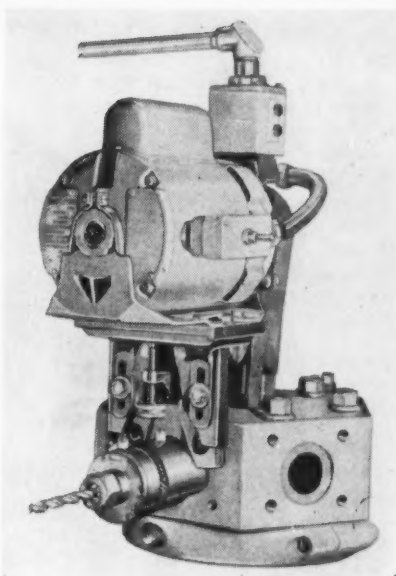
Both presses have completely enclosed hydraulic systems which prevent fluid contamination. Their hydraulic cylinders are constructed of cast steel for greater reliability and have been provided with machined shoulders to transmit loads evenly and squarely to the frame head channels.

The Model HP-25-E22, of 25 ton capacity, is equipped with a 2 h.p. motor, has a ram speed of 28 i.p.m. at no load and 12.2 inches at full load. The Model HP-40-E22, of 40 ton capacity, is equipped with a 2 h.p. motor, has a ram speed of 17 i.p.m. at no load and 8 i.p.m. at full load.

For more data circle 89 on Postpaid Card



25 Ton Capacity Electric Hydraulic Press.



Boyar-Schultz Deep Hole Drilling Attachment

### DEEP HOLE DRILLING ATTACHMENT FOR TURRET LATHES

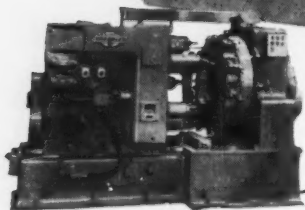
Boyar-Schultz Corp., 2020 South 25th Ave., Dept. F-B, Broadview, Ill., has developed an attachment for turret lathes, to broaden the application of its deep hole drilling tools, until now used only on single and multiple spindle automatics.

The attachment makes possible deep hole drilling with greater speed and accuracy. A completely adjustable, self contained unit, it fits into any hole on the turret without interfering with other positions. Full rotating electrical power lead—360 degrees—avoids entangling lead cord.

Powered by a  $\frac{3}{4}$  h.p. motor, 1,725 r.p.m., 110 volt single phase 60 cycle or 220 volt three phase 60 cycle.

Boyar-Schultz Model TL Deep Hole Drilling Attachment is designed to fit: Warner and Swasey Nos. 3, 4

... an example of Automatic Production by Greenlee ...



## 97 cast iron oil pump bodies an hour

This Greenlee 12-station, horizontal indexing machine rough and finish machines cast iron oil-pump bodies for a leading auto producer at the rate of 97 pieces per hour. Indexing is fully automatic. Cycle time is 37.2 seconds. Tolerances of  $\pm .001$ " for boring depth and  $\pm .0005$ " for ream hole size are maintained.

STATION 1 — load, unload

STATION 2 — drill

STATION 3 — drill

STATION 4 — drill, chamfer

STATION 5 — rough bore

STATION 6 — rough ream

STATION 7 — rough bore

STATION 8 — semi-finish bore

STATION 9 — semi-finish bore

STATION 10 — finish ream, finish bore

STATION 11 — finish ream

STATION 12 — finish ream, finish bore

Let a Greenlee representative show you the modern Greenlee cooperative engineering approach to automatic production.

MACHINES DESIGNED WITH THE FUTURE IN MIND

**GREENLEE**

**TRANSFER MACHINES  
STANDARD AND SPECIAL  
MACHINE TOOLS**

- Multiple-Spindle Drilling and Tapping Machines
- Six and Four-Spindle Automatic Bar Machines
- Die Casting Machines
- Trim Presses
- Woodworking Machines and Tools
- Hydraulic and Hand Tools

**GREENLEE BROS.  
& CO.**

1907 MASON AVE.  
ROCKFORD, ILLINOIS

For more data circle 471 on Postpaid Card

## **new equipment . . .**

and 5, Gisholt Nos. 3 and 4 and Jones and Lamson Nos. 3 and 4.

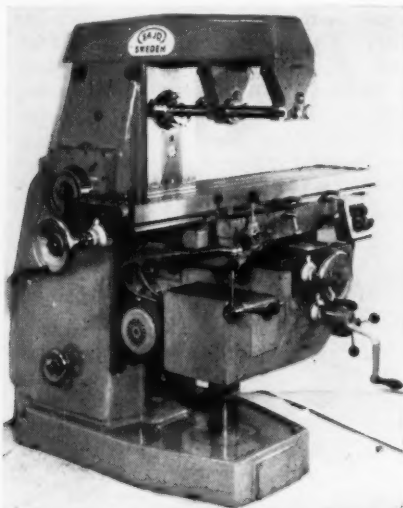
For more data circle 90 on Postpaid Card

★ modern machine shop ★

### **AUTOMATIC PRODUCTION MILLING MACHINE**

An automatic cycling miller, designed for time and labor-saving on production milling operations, has been added to the Sajo line of knee type horizontal and vertical milling machines, according to Austin Industrial Corp., 76-H Mamaroneck Ave., White Plains, New York.

The No. 2 Production Miller, Model 54, offers a selection of automatic table cycles, ranging from conventional one-way milling with return rapid traverse to skip-feed milling and continuous two-way milling with rapid traverse between cuts, with or without spindle braking. The machine is fully automatic, the operator being required



**Sajo No. 2 Automatic Cycling Miller.**

only to load and unload the work. Using relatively simple tooling, even unskilled operators can easily tend two or more machines.

Changeover from one automatic table cycle to another is made in minutes from the operator's position, making the machine as equally efficient and economical on small and medium lots as on long production runs. The automatic cycling arrangement can as easily be disengaged and the machine used for conventional operator-controlled milling, when desired.

For more data circle 493 on Postpaid Card

★ modern machine shop ★

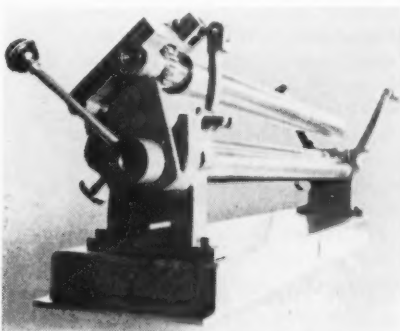
### **SLIP ROLLS FEATURE CAM LIFT**

Berkroy Products Co., 1171 East 32nd St., Los Angeles 11, Calif., introduces a complete line of slip rolls in five sizes—12, 18, 24, 30 and 36 inches.

The Berkroy Slip Rolls feature a cam lift for quick removal of material; fingertip controls permit fast and accurate adjustment for any material thickness within the capacity range of the slip roll. Feed and forming rolls are 2 inches in diameter.

Berkroy Slip Rolls also feature steel gears and oilite bearings, which eliminate the need for lubrication during the life of the unit.

For more data circle 91 on Postpaid Card



**Berkroy Slip Rolls come in five sizes.**

Gaertner Optical Instrumentation  
designed and manufactured in the U.S.A.



## Coordinate Cathetometers reduce inspection time

Gaertner Coordinate Cathetometers are reliable optical instruments for making precise measurements in the vertical plane. Because they permit reading two coordinates in a single setting, they reduce inspection time and eliminate resetting errors.

In addition to the routine inspection applications, these instruments permit measurements on larger objects as well as objects or points in recessed, remote or inaccessible locations. They eliminate the errors and indecisions associated with mechanical-contact measurements.

Illustrated is Gaertner's M1238-1818 instrument. It has a range of 18" x 18", working distance of 9" to infinity, and reads to 0.001" up to 24" working distance. Protractor ocular reads up to 3 minutes of arc. Larger ranges are available. Smaller types provide reading to 0.0001".

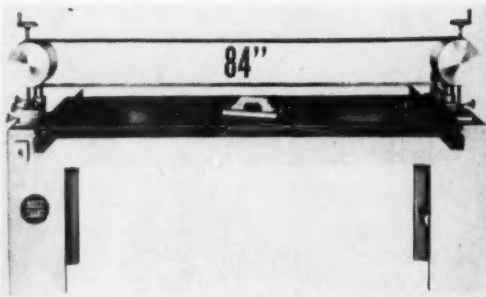
Write for Bulletin 194-57

Use Postpaid Card, Circle No. 472

1275 Wrightwood Ave., Chicago 14, Ill., BU 1-5335

**Gaertner**  
SCIENTIFIC CORPORATION

new equipment . . .



The Boice-Crane Belt Sander-Finisher

## SANDER-FINISHER

A large capacity hand stroke belt sander-finisher, for finishing wood, ferrous and non-ferrous metals and plastics, has been added to the power tool line of Boice-Crane Co., 937 West Central Ave., Toledo 6, Ohio.

This Boice-Crane, which fills the demand for a larger and faster belt abrasive machine, has a reciprocating work table with more than double the area of its preceding model. The table actually measures 84 by 28 inches. This model is suitable for finish sanding assembled doors in the building trades, and some of the largest steel sheets in the fabricating field.

For more data circle 92 on Postpaid Card

★ modern machine shop ★

## MOTORIZED AUTOMATIC FEEDING MACHINE

Known as the MAF Machine, this new development of Benchmaster Mfg. Co., 1835 West Rosecrans Ave., Gardena, Calif., automatically feeds uniform, predetermined lengths of material to any secondary machine. It consists of a friction type roll feed mechanism, driven by a constantly running electric motor-driven fly-

# Power Accuracy

Photograph (actual size) of chip cut on R Series 15" Sheldon lathe. Depth of cut .250", Feed .016", Spindle Speed 400 r.p.m., Steel B-1112, Dia. of Work Piece 3".

"Free Running" spindle (Patent Pending) has no drive pressures to cause deflection. (See cut-out below.)



# and Price

## SHELDON R-Series 15" Precision Lathes

Revolutionary in concept and design, these lathes deliver extra power and accuracy to the spindle nose.

Power is transmitted through 3 steel cable V-belts to the headstock input pulley assembly. (1) It is held free from the spindle by its own large tapered roller bearings. The input (1) assembly, then, absorbs all the drive pressures and transmits power to the free running spindle through a clutch (2A) in direct drive or gears (2B) in back gear drive.

This design (Patent Pending) eliminates spindle deflection resulting from drive pressures and leaves the spindle free for accurate work holding. Spindle nose runout is .0003" or less.

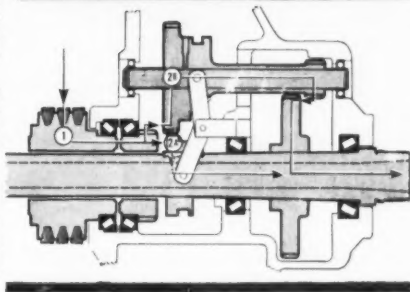
Other features include large 1 1/4" hole through spindle... 60 pitch gear box with built-in lead screw reverse lever... apron that runs in oil and has independent drop lever clutches for power feeds... cam action tailstock clamp for rapid locking and instant release.

Write for bulletin and sample accuracy test sheet.

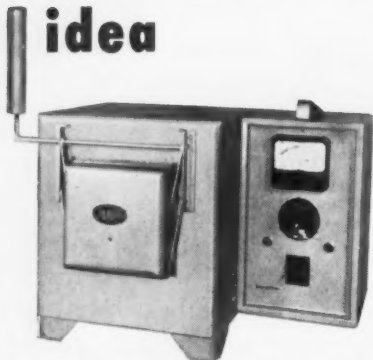
## SHELDON MACHINE CO., INC.

For more data circle 473 on Postpaid Card

4250 KNOX AVE.,  
CHICAGO, ILL.



## production short-cut idea



### HEAT-TREAT SMALL PARTS, TOOLS, DIES, ETC., WITH A VERSATILE, HIGHLY EFFICIENT TEMCO FURNACE

Why tie up your big equipment on small heat-treat jobs below its capacity? Put a TEMCO bench-type electric furnace in your shop and see how it pays for itself over and over again—in timesavings, costsavings, and production conveniences. Shown above is Type 1600 Furnace with TEMCOMETER-type controller in new cabinet assembly.

TEMCO Furnaces are economical to own and operate . . . easy to hook up . . . easy to use. Thirty models with chamber sizes from 4" x 3 3/4" x 4 1/4" to 10" x 9 1/2" x 22". \$72.50 to \$1200.00 complete with controls. Write for literature and name of nearest dealer.



**ELECTRIC FURNACES**  
Thermo Electric Manufacturing Co.

488 Huff St., Dubuque, Iowa

For more data circle 474 on Postpaid Card  
230 MODERN MACHINE SHOP

new equipment . . .



*Motorized Automatic Feeding Machine.*

wheel. A solenoid operated clutch-brake unit instantly engages the rolls or it will stop the roll motion upon disengagement.

An adjustable length measuring control (timer) can be preset to continuously and automatically produce any work length within the machine's range from 3 to 60 inches. Micrometer control permits work length adjustments to 1/32 inch or less. Standard feed speed is 50 s.f.m. Benchmaster MAF Machines, available in several models, handle stock up to 12 inches wide and to 1/8 inch thick.

For more data circle 93 on Postpaid Card

★ modern machine shop ★

### DISC GRINDING BECOMES A FULL-VIEW OPERATION

Disc grinding can now be performed with the work-point in full view of the operator as he grinds. In order to

May, 1960



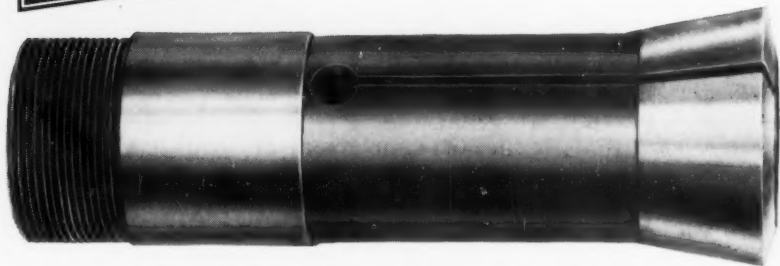
**Tired of the same  
old collets?**



**THEN TRY -**

**RIVETT**

**For Greater Accuracy  
and Trouble-free  
Longer Life!**



## **DRAW-IN COLLETS!**

- ★ Fully Heat Treated
- ★ Ground all over including threads
- ★ Checked 25 times Against Master Gauges
- ★ Selected Collets run dead true at the mouth and within .0002" measured 1" away from mouth
- ★ Stocked For Immediate Delivery
- ★ Made in Standard and Special

Styles for Lathes, Millers, Grinders and Fixtures

- ★ Fractional Round Sizes and Decimal Equivalents from 1/64th to capacity
- ★ Square, Hexagon and Taper holes
- ★ Transparent Packaging for Easy Identification
- ★ Write for Bulletin 100E

### **RIVETT LATHE & GRINDER, Inc.**

MMS-5 Brighton 35, Boston, Massachusetts

For more data circle 475 on Postpaid Card

### **new equipment . . .**

obtain this result, Behr-Manning Co., Troy, N. Y., has developed a special fiber-backed abrasive disc with two parallel straight sides. The resultant product is a rectangular section with a radius at each end.

As such a "disc" rotates, a full inch at its outer edge—the area where all disc grinding is done—becomes transparent. Grinding is faster because the abrasive disc need not be moved away from the work point for frequent inspection. Dwell time is reduced because grinding can be confined to the exact area that requires it. Contour work and blending of welds can be done with complete accuracy. Because the actual grinding is intermittent, the metal remains so cool that burning and heat distortion are practically impossible.

The new "Vizi-Discs" are available in 7 and 9 inch sizes. They are sur-



The "Vizi-Disc" as it appears at rest.

faced with the sharp-cutting Metalite, an aluminum oxide abrasive, in the standard range of grit sizes. In use,

## **DRILL HARDENED STEELS WITHOUT ANNEALING —**



With the new, improved "HARDSTEEL" Drill, you can do accurate, smooth drilling, countersinking, counterboring and reaming in steels hardened by any process without first annealing the work. And they work with equal ease on work-hardening steels and high carbon - high chrome steels of any degree of hardness. "HARDSTEEL" Drills fit standard drill presses. They save time and reduce rejects. They permit engineering changes requiring additional drilling after hardening. And parts drilled after hardening always match at assembly. Write for a copy of the "HARDSTEEL" Operators Manual showing how "HARDSTEEL" Drills are cutting costs in thousands of plants.

### **BLACK DRILL COMPANY, INC.**

1372 East 222nd Street • Cleveland 17, Ohio

YOU HARDEN IT —  
WE'LL DRILL IT WITH —

# **"HARDSTEEL"**

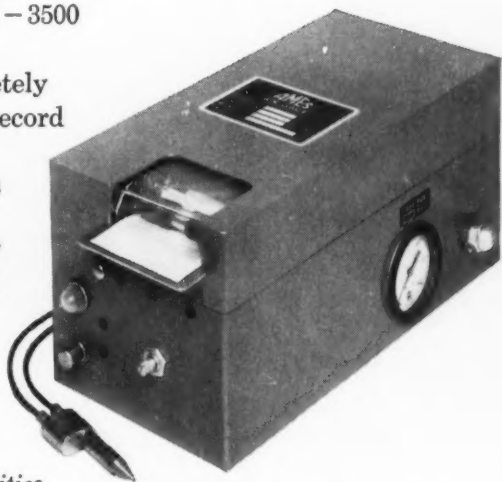
For more data circle 476 on Postpaid Card

*Announcing*  
an important new development  
for quality control measurement  
**AMES MODEL AG7**  
**Accu-Flow\* Air Gage Recorder**

A permanent record of continuous measurements can be made in magnifications of 1750 to 1—3500 to 1—and 17,500 to 1.

The AG7 provides a completely impersonal measurement record that can be used both as a controlling device and as a means of furnishing visible "proof of precision" to buyers of the measured products. Send for free ACCU-FLOW folder.

\*Trademark of B. C. Ames Co.



*Representatives in Principal Cities*



**B. C. AMES CO.**

29 Ames Street, Waltham 54, Mass.

Canadian Representative—H. C. Burton Co. Ltd., Hamilton

MANUFACTURERS OF MICROMETER DIAL INDICATORS AND GAGES  
For more data circle 477 on Postpaid Card



## Airetool Midget Die Grinders finish intricate work perfectly

Airetool die grinders are lightweight and power-packed. Yet there's no vibration. Operators easily maneuver these tools with complete accuracy. The reason is Airetool's precision-made, 3-blade air motor that delivers power smoothly. Airetool makes 3 models of midget die grinders for all types of work . . . 19,000, 38,800 and 60,000 rpm operating speeds. For complete details, write for Bulletin 67. Airetool Manufacturing Co., Springfield, Ohio.



Airetool offers a complete line of midget carbide mills: cylindrical, cylindrical rounded, ball, tapered, inverted cone, pear, egg, tree and rounded tree shapes. Write for Bulletin 63.



30 years experience  
in pneumatic tools

**BRANCH OFFICES:** New York, Chicago, Tulsa, Phil-

adelphia, Houston, Baton Rouge

**REPRESENTATIVES** in principal cities of U.S.A.,

Canada, Mexico, South America, England, Europe,

Puerto Rico, Italy, Japan, Hawaii

**EUROPEAN PLANT:** Vlaardingen, The Netherlands

**CANADIAN PLANT:** Brantford, Ontario

For more data circle 478 on Postpaid Card

234 MODERN MACHINE SHOP

## new equipment . . .

they are supported by sisal-reinforced rubber back-up pads, slightly smaller than the abrasive disc. Heavy duty pads of the same construction are available for aggressive grinding. Pads are surfaced with a diamond grid pattern to prevent slippage.

Accessory kits contain a pad, a retainer nut and a wrench.

For more data circle 94 on Postpaid Card

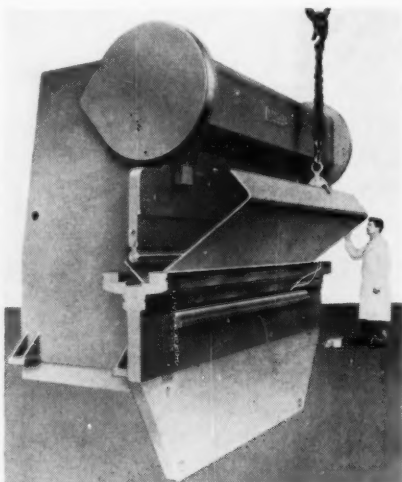
★ modern machine shop ★

## PRESS BRAKES ARE REDESIGNED AND ENLARGED

Series N Press Brake design features and expansion of tonnage capacities (now 90 through 1,500) are announced by Niagara Machine & Tool Works, Buffalo 11, New York.

Overall bed and ram lengths range from 6 to 24 feet, while bending capacities are for 12 gage to 1 inch mild steel.

Principal among the design changes are: choice of power or manual clutch,



Niagara Press Brakes have been redesigned

May, 1960

New

## METROsurf\*

*the only battery powered  
surface roughness indicator*



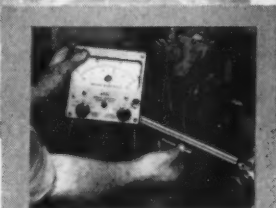
*newest.. most accurate .. rugged*

Today's precision requirements rule out "eye" or "feel" methods of checking surface finish. METROsurf makes it more accurate, easier and faster.

- 5 range selections for any precision roughness measurement: 3, 10, 30, 100 and 300 microinches—full scale.
- Roughness width cut-off available in three ranges: .003, .010 and .030.
- Hand held or motor driven.
- Long life batteries.



Small, light, battery powered.



Easy to read—easy to use at the machine.



Measure any surface  
—ID, OD, even gear teeth.

Call your Cutler-Hammer office or write:

Price: \$495.00

®Trade Mark



**AIRBORNE INSTRUMENTS LABORATORY**

DEER PARK, LONG ISLAND, NEW YORK

**A DIVISION OF CUTLER-HAMMER INC.**



For more data circle 479 on Postpaid Card

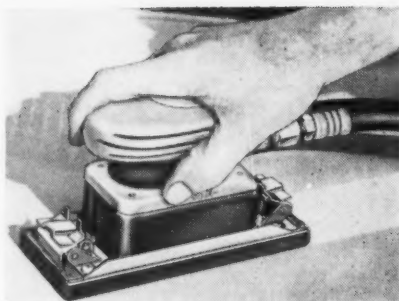
May, 1960

MODERN MACHINE SHOP 235

### new equipment . . .

brake and treadle; two speed transmission; rocker type end guide bearings for precise, endwise alignment, even when the ram is tilted for taper work; wide choice of special features and arrangements to meet individual conditions.

Streamlined in appearance, construction is of one piece welded steel, except in the larger sizes where the deep bed, extending below the floor, is removable. Both frame and bed are scientifically designed for utmost rigidity and longer die life. A box type crown encloses connections and places them closer together for a stiffer ram. The latter, of extra heavy rolled steel plate, gives maximum support to dies. For more data circle 95 on Postpaid Card

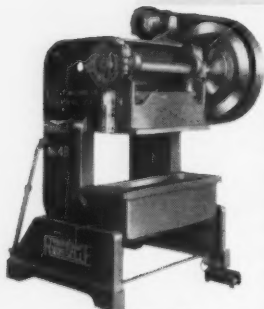


The new Sioux Air Driven Flat Sander.

### AIR SANDER

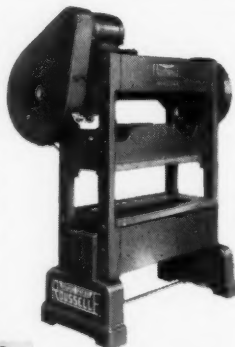
Albertson & Co., Inc., Sioux City, Iowa, introduces its Sioux Air Driven Flat Sander. Among its design features is a 6 foot remote exhaust hose

## High-Output with **ROUSSELLE** DOUBLE-CRANK PRESSES



No. 4B OBI with  
"Econo-Air" clutch.

**SPEED UP PRODUCTION** with these versatile 40-ton presses. Large bed and ram areas make them ideally suited to handle wide rolls or sheets . . . do multiple punching, steel-rule die work and other high output operations. For rapid, shockless starting and stopping, presses can be equipped with electrically controlled "Econo-Air" friction clutch . . . Ask for new catalog.



**STRAIGHT SIDE**—Die space up to 24 in.; bed space up to 6 ft. between uprights.

Choice of over 30 models and types in 5 to 60-ton sizes



### SERVICE MACHINE COMPANY

Mfrs. of Rousselle Presses

2310 WEST 78TH STREET • CHICAGO 20, ILLINOIS

Rousselle Presses are sold exclusively through Leading Machinery Dealers.

For more data circle 480 on Postpaid Card



# NEW RANGE OF SIZES

## DiaTest

HIGH PRECISION

### SMALL BORE GAGE

- **RANGE:** .047" to 1.130"
- **5 SETS**, fully equipped with rings and measuring heads.
- **READINGS IN .0001"**
- **ACCURACY TO .00008"**

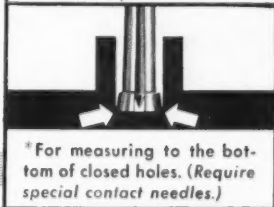
DiaTest checks out-of-round, tapers, incomplete bores and all other variations. All sets overlap in size for complete range.

All parts available separately.

EACH SET complete with dial indicator.

SET No.	RANGE
E-1	.057" — .170"
E-2	.165" — .390"
E-3	.372" — .828"
E-4	.820" — 1.130"

* E-1FB	.057" — .170"
* E-2FB	.165" — .390"
* E-3FB	.372" — .828"
* E-4FB	.820" — 1.130"



\*For measuring to the bottom of closed holes. (Require special contact needles.)

### ANNOUNCING NEW SETS

- **SET No. E-0:** Range .047" to .062"
- **SET No. E-161:** Nominal Range,  $\frac{1}{16}$ " to  $\frac{3}{8}$ "  
(A "fractional" set, in increments of  $\frac{1}{16}$ " )

RIGHT-ANGLE ATTACHMENT, EXTENSION RODS, AND DEPTH ADJUSTER ACCESSORIES ARE INTERCHANGEABLE.

Write today,  
or call  
NEUcastle 1-8888  
for full  
information.

## FOSTER SUPPLIES CO.

6122 Milwaukee Ave., Dept. MMS, Chicago 46, Illinois

For more data circle 481 on Postpaid Card

## **new equipment . . .**

which carries noise, exhausting air and motor lubricant away from the operator and the work. The sander is designed to best fit the hand for perfect touch and control. A palm switch gives instant action. Operation is at 6,000 c.p.m. with a 3/16 inch circular action. Average air consumption is 3 1/4 cubic feet and recommended air pressure is 75 p.s.i. Pad size

is 2 15/16 by 6 3/8 inches. The sander weighs 5 1/4 pounds and produces a minimum of vibration. It is designed for wet or dry sanding.

For more data circle 96 on Postpaid Card

★ modern machine shop ★

## **TUBULAR STEEL FACTORY STOOL WITH WOOD SEAT**

American Metal Works, Inc., Bay Products Div., 1827 West Cambria St., Philadelphia 32, Pa., announces stools

which have been designed to solve the chronic factory problem of work stool damage. The welded steel tubing legs and crossbar are said to be many times more resistant to bending than the conventional angle sections. A silence dome is provided at the bottom of each leg for easy sliding and a laminated maple seat for maximum worker



**Tubular Steel Factory Stool with wood seat.**

## **how to trap dust**

*that damages your machines and hurts company morale*

Easy-to-move

### **TORIT**

dust collectors trap dust at its source!



Untrapped dust costs money: "secretly" forces precision machines out of line, limits production. Torit dust collectors are unitized for custom installation—save more money, usually more efficient than central (built-into-building) system. Torit unit operates only when machine or combination of machines it protects are on. Filtered air may be returned to room to save heat. Many models and sizes, all self-contained, easy to move. Write today to . . .

### **TORIT**

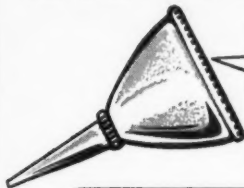
*manufacturing co.*

Dept. 701, 1133 Rankin Street, St. Paul 16, Minn.

For more data circle 482 on Postpaid Card

JARVIS UNVEILS A REVOLUTIONARY DESIGN  
IN COLD FORMING TAPS! NEW JAR-FLO  
**LUBE-GRUV® TAPS**

**LUBRICATION GROOVES MAKE  
CHIPLESS FORMING OF INTERNAL THREADS  
AS EASY AS CONVENTIONAL TAPPING!**



**NOW**, for the first time, cold forming taps that give *full time lubrication* to the forming contact area during the full tapping cycle.

**LUBE-GRUV** gives you a *far superior finish* on the formed threads than is possible with conventional cold forming taps.

**USE CONVENTIONAL TAPPING EQUIPMENT.** The combination of *positive lubrication* and *narrow contact surface* makes the forming of internal threads much easier than with ordinary cold forming taps. Jar-Flo with LUBE-GRUV has less drag, requires less driving torque.

**LUBE-GRUV Jar-Flo TAPS FOR CHIPLESS  
FORMING INTERNAL THREADS IN DUCTILE MATERIALS  
STRONGER THREADS—NO CHIPS—  
AVAILABLE IN PLUG OR BOTTOMING TYPES**

SEND FOR  
COMPLETE  
DETAILS



**JARVIS CORPORATION**

**JARVIS CORPORATION**, 101 Washington Park  
North Attleboro, Mass.

☐ Have Rep. call ☐ Rush LUBE-GRUV Brochure

Name  Title

Company

Street

City & State

For more data circle 483 on Postpaid Card

## new equipment . . .

comfort. Standard height is 24 inches, but other heights are available.

For more data circle 97 on Postpaid Card

★ modern machine shop ★

### STANDARD AIR CYLINDERS FOR UP TO 750 P.S.I. OPERATION

Flick-Reedy Corp., Miller Fluid  
Power Div., 7N023 York Rd., Bensenville, Ill., announces that its standard

line of Model "A" Air Cylinders in 1½ to 14 inch bores is now rated for up to 750 p.s.i. operation, depending upon bore size, as follows: 1½ and 2 inch bores, 750 p.s.i.; 2½ inch bore, 500 p.s.i.; 3¼ inch bore, 750 p.s.i.; 4, 5 and 6 inch bores, 400 p.s.i.; 8, 10, 12 and 14 inch bores, 250 p.s.i. The higher ratings have no effect on the low pressure operation of the air cylinders, which must be able to cycle smoothly at as little as 2 p.s.i. before passing the manufacturer's standard bench test prior to the shipment.

According to the manufacturer, the higher ratings have been made possible by the fact that many of the features of Miller Hydraulic Cylinders have been incorporated into Miller Air Cylinders.

For more data circle 98 on Postpaid Card

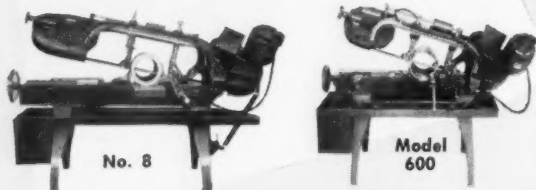
★ m m s ★

### SURFACE GRINDING MACHINE

Harig Mfg. Corp., 5765 West Howard St., Chicago 31, Ill., has announced its new 612, which is a compact, precision surface grinder.

It represents a breakthrough in design and construction, where-

## Simple Design... Rugged Construction



### WELLS HORIZONTAL METAL CUTTING BAND SAWS

The simple design and rugged construction of every "Wellsaw" didn't just happen. We planned it that way! Over 30 years of specialized band saw experience and know-how is your assurance of the quality and service with each machine produced by Wells Manufacturing Corporation.

There is a Wells Saw of the right style, capacity and speed to do a better, more economical job for you. Wells Saws will deliver long, dependable service. Operating and maintenance costs are very low. See your Wells Distributor.



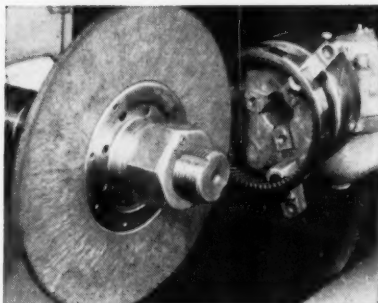
*The Pioneers of Horizontal*  
**METAL CUTTING  
BAND SAWS**  
WELLS MANUFACTURING CORPORATION

808 Tyler Street • Three Rivers, Mich.

For more data circle 484 on Postpaid Card

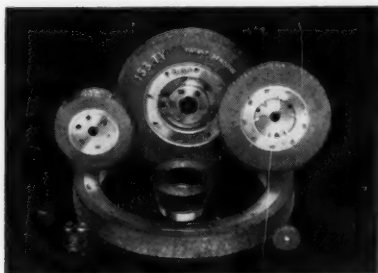
# **OSBORN** announces:

**a new concept in power brushing tools**



▲ **Blending Gear Tooth Edges**  
and deburring are done in a single  
precision operation with Osborn TY  
Monitor® Brush running at 1750 rpm  
on a Brushmatic® 3A Machine.

**Cleaning and Finishing**  
internal surfaces of machined castings  
is done with an Osborn TY  
Ringlock® Brush mounted on a  
simple drill press setup. Operation is  
rapid, thorough—low cost. ▶



**Complete TY® Brush Line** is  
available in types and sizes to meet every  
application need in basic industries.

**METAL FINISHING MACHINES... AND FINISHING METHODS**  
**POWER, PAINT AND MAINTENANCE BRUSHES • FOUNDRY PRODUCTION MACHINERY**  
For more data circle 485 on Postpaid Card

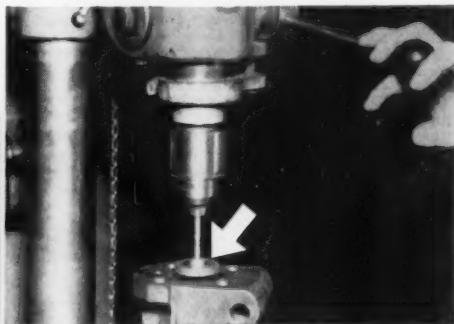
**How TY® BRUSHES**  
will significantly cut  
your finishing costs


Designed for jobs *beyond the reach of*  
standard wire power brushes, Osborn  
TY® Tool Brushes are literally a new concept  
in finishing tools.

Where rotary files, abrasive stones or  
belts, tumbling and shot blasting equip-  
ment have been used—TY Brushing  
Methods now do many of these jobs *better*  
... *at significantly less cost.*

These exclusive TY Brush advantages  
have been proved through extensive field  
tests — Maximum of work efficiency with  
minimum of pressure • Greatly increased  
brushing action strength • Positive control  
over area of brush contact • Complete  
uniformity of finish • Exceptionally long  
brushing tool life.

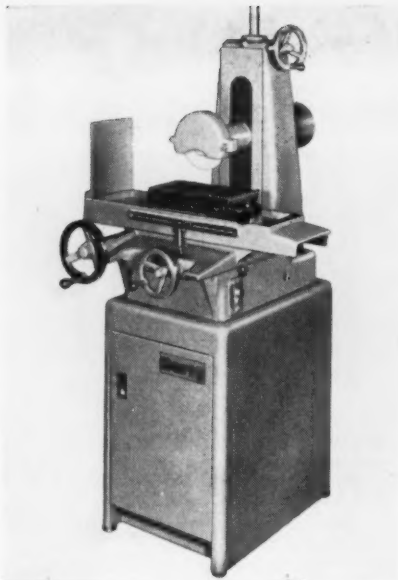
Osborn TY Brushes will give you a higher  
rate of output... better product quality  
... lower end-of-service cost. Write or call  
us today for full information. No obligation  
of course. *The Osborn Manufacturing  
Company, Dept. B-28, Cleveland 14, Ohio.*



**Osborn Brushes** 

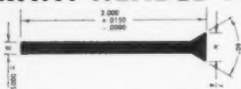
## new equipment . . .

by the company now offers industry a low cost, precision surface grinder featuring automatic forced lubrication, direct drive motor and choice of right or left hand longitudinal feeds as standard equipment. These desirable features greatly simplify grinder operation and maintenance. For example, the automatic forced lubrication goes into operation as soon as the machine is started. This is intended to triple the life of the ways and preserve original accuracy. Increased power is achieved through the direct drive



Harig 612 Surface Grinding Machine.

## DURANT HEADED PINS



All tool steel Rockwell C 58/60 — honed finish, no pickup — heads left soft and are guaranteed uniform. Attractively priced at \$12. to \$19. per C. We manufacture 103 and stock 103 sizes for immediate delivery.

Available through our distributor or order direct.

Write for complete prices and details.

**DURANT TOOL CO.**

12 THURGOOD AVENUE  
PROVIDENCE 5, RHODE ISLAND

For more data circle 486 on Postpaid Card

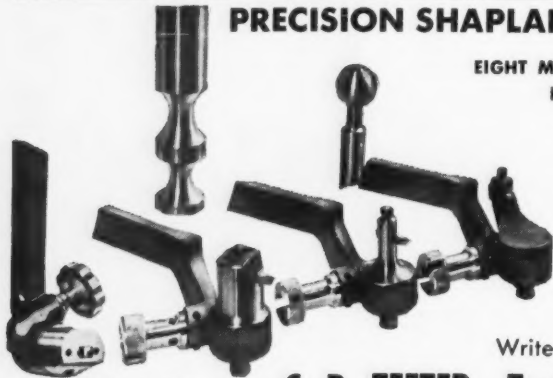
motor. Advantages of a choice of right or left hand longitudinal feeds are obvious.

For more data circle 429 on Postpaid Card

## PRECISION SHAPPLANE RADIUS TOOLS

EIGHT MODELS FOR LATHES, SHAPERS, PLANERS AND BORING MILLS

Range:  $\frac{3}{8}$ " to 3" for concave radii on lathes. Two sizes for convex radii (Balls up to  $2\frac{1}{2}$ " dia.) on lathes. Also heavy duty model for radii to 6" on planers, etc.



Patent Pending

Write for circular

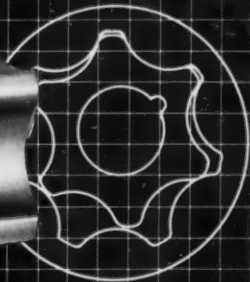
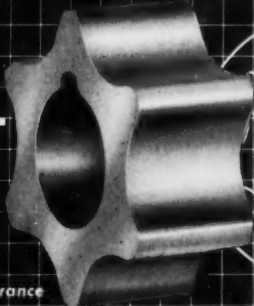
**C. B. TEETER - Tool Room Specialties**

3443 N. Greenview Ave., Chicago 13, Illinois • Phone DRexel 3-3571

For more data circle 487 on Postpaid Card

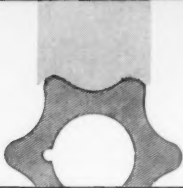


## hoglund contour dressing...

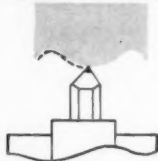


Six faces ground to .0002" tolerance  
and 9 microinch finish.

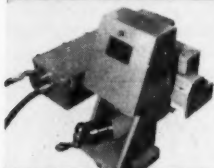
*Closer tolerances in pump assembly  
increase rotor life and efficiency,  
improve slippage characteristics.*



13 stacked impellers are  
automatically indexed and  
the form ground in 6 sepa-  
rate positions.



After each impeller stack is  
ground, wheel is dressed at  
uniform peripheral speed  
with diamond normal to sur-  
face.



Hoglund Model 38A Dresser  
features computed master  
contour template, 10 to 1  
inclined plane cam reduction,  
diamond cooling during  
dressing.

## boosts impeller grinding rates — improves pump performance

This impeller is typical of the countless form grinding applications where the accuracy initiated by Hoglund Contour Dressers enables both product and production improvement.

A Hoglund Model 38A Dresser, installed on a 12x40 surface grinder helped boost production 40%, improved tolerances, and lowered surface finish from 20 to 9 microinches. Combined high accuracy and high production are assured because: a) all Hoglund templates and ratio cams are individually computed to the job; b) only with the simplicity and ingenuity of inclined planes can you sustain accuracy and automaticity.

Over 120 different types of Hoglund Contour Wheel Dressers are now in service — enabling "tenth tolerance" contouring of intricate forms heretofore impossible to grind. They're adaptable to all types of grinders.

If you are grinding simple or intricate forms, you will want the whole Hoglund story in Hoglund's new technical brochure. Let Hoglund engineers recommend a suitable solution to your problem.

# HOGLUND

ENGINEERING & MANUFACTURING CO., INC.

338 Snyder Avenue • Berkeley Hts., N. J.

Send for brochure  
on solutions to  
tough profil-  
ing problems.

Name \_\_\_\_\_ Title \_\_\_\_\_

Co. \_\_\_\_\_

Address \_\_\_\_\_

City \_\_\_\_\_ Zone \_\_\_\_\_ State \_\_\_\_\_

For more data circle 488 on Postpaid Card

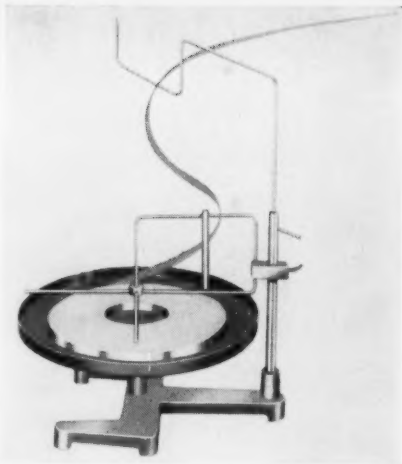
**new equipment . . .**

### **AUTOMATIC STOCK REEL**

The natural spring of the uncoiling stock rotates the ball bearing mounted platen in the new automatic stock reel being marketed by The Durant Tool Co., 17 Thurbers Ave., Providence 5, Rhode Island.

Designed so that no disassembly of the stock reel is necessary in loading, this new Durant Reel features a movable stock bar that is spot-welded to the guiding mechanism for better initial control, plus a new type of stabilized base. The Durant Stock Reel takes up to 6 inch wide material of any thickness that can be coiled. It is available in five sizes: 18, 24, 30, 36 and 40 inch.

For more data circle 99 on Postpaid Card



*Automatic Stock Reel comes in five sizes.*

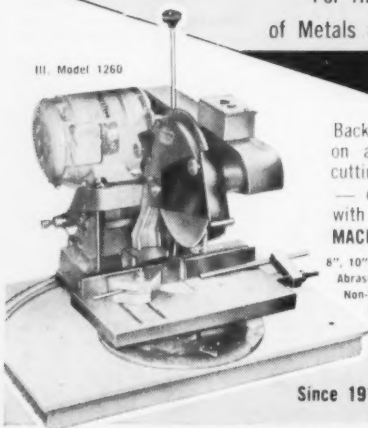
# **CUT AT ANY ANGLE**

**With The New 1960 Models!**

# **BACKUS CUT-OFF MACHINES**

For High Speed Cutting of All Types  
of Metals and Materials

**At Any Angle!**



III. Model 1260

Backus Cut-Off Machines make the finest precision cuts on any material, **at any angle**, to meet your most exacting cutting requirements. Precision engineered, these machines — complete-ready-to-operate — combine sturdy construction with the exclusive Backus leverage control. **SEE YOUR MACHINERY DEALER OR WRITE TO BACKUS FOR BROCHURE!**

8", 10" & 12"  
Abrasive and  
Non-Ferrous  
Models

## **BACKUS MACHINE WORKS**

Since 1914

**ROUTE 17 DEPT. MT CARLSTADT, N. J.**

For more data circle 489 on Postpaid Card



## NOBLEWEST *Precision Numbering Heads*

1 2 3 4 6 6  
1 2 3 4 6 7  
1 2 3 4 6 8  
1 2 3 4 6 9  
1 2 3 4 7 0  
1 2 3 4 7 1

Fast, accurate and dependable, Noblewest Numbering Heads are preferred by the leaders in industry. They have unlimited applications for *constant*, *selective* and *consecutive* numbering. Designed for use in either marking presses or Noblewest Roll Marking Machines—wherever permanent numbering is required. Available in a wide variety of automatic, non-automatic and lever operated models with number sizes from 1/40" to 1/2". Special numbering heads are made to any requirements including embossing heads and numbering heads combined with marking dies. Write for new catalog. The Noble & Westbrook Manufacturing Company, 25 Westbrook Street, East Hartford 8, Conn.

*A few desirable territories open to qualified representatives*

MARK IT BEST WITH

# NOBLEWEST

**NOBLEWEST**  
IMPROVED  
MARKING  
DEVICES

MARKING  
NUMBERING  
EMBOSSING  
GRADUATING

For more data circle 490 on Postpaid Card

**new equipment . . .**

### **2½ AND 3 INCH OIL BY-PASS RELIEF VALVES**

Three hydraulic system valves are announced by Fulflo Specialties Co., Inc., 416 Fancy Ave., Blanchester, Ohio.

All are flange type and designed for by-pass oil relief service. One 2½ inch model allows control of pressures up to 325 pounds, the others are speci-

fied for maximum operating pressures up to 100 pounds.

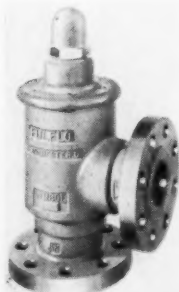
Models LFC-9 and LFC-10 are 2½ and 3 inch sizes, which follow the Fulflo construction of a spring loaded piston which starts to open at the set pressure and, under greater pressure, opens completely to allow "full-flow" by-passing of excess oil. Closing employs a shearing action, which eliminates chattering. Spring tension can be adjusted in order to give varying operating pressures. The Model

HFC-9 is a 2½ inch flange valve designed for 325 pounds maximum pressure and it uses a pilot type operation with two pistons and two springs.

All of the valves have cast iron bodies with steel or stainless steel trim.

Both 2½ inch valves have 300 pound standard flanges and the 3 inch valve has 600 pound standard flanges.

For more data circle 100 on Postpaid Card



**Fulflo HFC-9 Valve**

## **ALL NEW**

# **MARK II Shoplifter**

**New Low Price \$195.00\***  
**New Capacity Full 750 lbs.**



**ECONOMY  
ENGINEERING**

4507 W. Lake St., Chicago 24, Ill.

All lifters at this price are not the same. Compare and note the quality of the new Mark II, which now replaces the Type D Shoplifter. Full 750 lb. capacity can be handled safely anywhere on the platform.

No-drift, full control hoist unit. Raise or lower the load to fractional positioning. Built for years of continuous service with minimum maintenance. Complete safety features included at no extra cost.

Applicable in small plants for "too heavy to lift loads" and in large plants to supplement powered equipment. The economical way to transfer molds and dies, unload trucks, stack in narrow aisles, or raise parts and machinery to working levels.

Write for specifications and other details.

\*Priced f.o.b. Chicago

For more data circle 491 on Postpaid Card

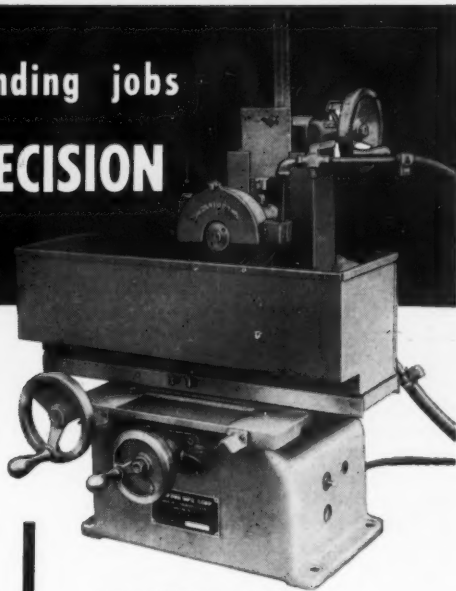
to do small grinding jobs  
to **MICRO-PRECISION**  
**FAST...**

**you need  
the  
SANFORD  
Model SG  
SURFACE GRINDER**

This unrivalled small parts grinder can be depended upon for micro accuracy. It's easy to use too . . . every hand wheel and operating switch is at your finger tips.

Designed and built by engineers and tool makers of rare foresight for tool, die and gage work, it has been constantly preferred after these many years of proven worth.

Write for fully illustrated literature, replacement parts and special attachments data with price list.



**For WET or DRY  
grinding, specify  
optional equipment.**

**PARTIAL SPECIFICATIONS —**

Chuck Surface—3" x 5" or 4" x 6".  
Table travel—8", traverse 4".  
Vertical head movement—6".  
Work area under 4" wheel—6",  
with chuck—4".  
Standard grinding wheel—  
4" x  $\frac{3}{8}$ " x  $\frac{1}{2}$ ".  
Spindle speed—approx. 5500 RPM.  
Motor, 1/6 HP, single or 3 ph.,  
dynamically balanced.  
Dimensions—23" x 30" x 27" high.  
Net wt. approx. 160 lbs.

***Representatives in major industrial areas***

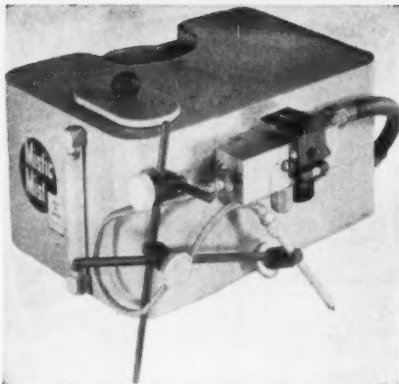
**SANFORD** MANUFACTURING CORP.  
1022 Commerce Ave., Union, N. J.

For more data circle 492 on Postpaid Card

**new equipment . . .**

### **MIST COOLANT GENERATOR**

Aetna Mfg. Co., 199 South York Rd., Bensenville, Ill., announces its Model D-60 Mist Coolant Generator, which is designed for use on drill presses having  $2\frac{3}{4}$  inch columns. Air and coolant are controlled automatically by the up and downward movement of the drill press spindle. The attachment of the tank to the drill column further permits complete operator freedom and greater press work capacity. In addition to the on-off control, needle valves permit precision air and coolant flow, set to meet the job requirements. The universal joint nozzle holder permits easy nozzle setting. The D-60 Mist Generator is ideal for multiple machine production use or general shop applications. It permits regulated control



**Aetna Model D-60 Mist Generator.**

of efficient mist cooling for all drill press operations and is said to greatly increase production out-put and tool life—for tapping, drilling, reaming and so on.

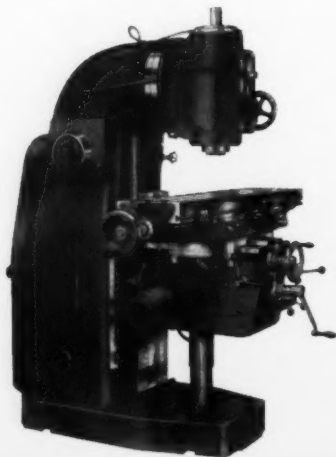
**For more data circle 101 on Postpaid Card**

### **POWER PERSONIFIED SAJO No. 2 Vertical Miller**

Just a glance at this rugged machine confirms its ability to perform with ease the most demanding jobs. Sajo's swivelling head, power feed to quill and unrivaled spindle construction combine versatility with unsurpassed tool room accuracy.

Also available —  
Horizontal Millers  
Plain and Universal

No. 2 Vertical Miller  
table size: 52" x 11"  
7½ and 1½ HP motors  
rapid power traverse



**austin industrial corporation**

**76-H Mamaroneck Avenue**

**For more data circle 493 on Postpaid Card**

**White Plains, New York**

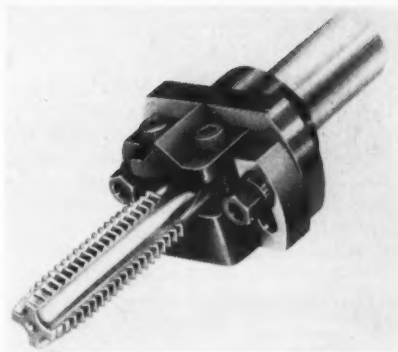


## NON-RELEASING TAP HOLDER

A vee jaw tap holder, that permits faster, easier screw machine setups while eliminating bushings and reducing tool inventory, has been developed by Brookfield, Incorporated, Stoughton 111, Massachusetts.

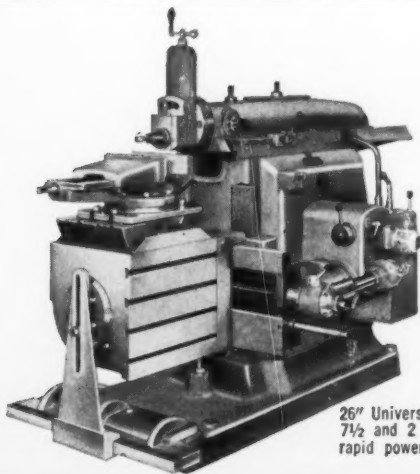
Featuring a uniquely designed construction that will accommodate either extended or close-held taps, this slip-in tap holder offers automatic, axially perfect tool alignment. It eliminates cutting off tap shanks, an operation often necessary with other types of bushing or collet type holders. By means of a balanced pressure locking assembly, uniform seating is maintained and the tap is firmly secure. It will not loosen, twist, creep or shift.

Another feature is the tap holder spring return assembly. It is totally enclosed to prevent chips or dirt from



*Non-Releasing Vee Jaw Tap Holder.*

snagging the free float of the axial movement control spring. Since the side pressure is also eliminated, the spring remains free-floating, even when adjusting for spindle misalignment. All working surfaces of the



26" Universal Shaper  
7½ and 2 HP motors,  
rapid power traverse.

## RUGGED DEPENDABILITY keynotes all VMA Shapers

for example:

Unique multi-piston oil pump assures automatic lubrication of all moving parts at pressure up to 400 p.s.i.  
Built as

Plain and Universal Shapers  
Production Model 18", 22" and 26"  
Standard Model 14" to 28"

Also available —  
Vertical Shapers  
5" and 12" stroke

**@ austin industrial corporation**

76-H Mamaroneck Avenue

White Plains, New York

For more data circle 494 on Postpaid Card

## new equipment . . .

Brookfield Tap Holder are hardened and ground to precise tolerances. Due to the adjustable vee jaw, each tap holder unit services an exceptionally wide range of tap sizes. Special shanks are also available from Brookfield to suit individual requirements.

For more data circle 102 on Postpaid Card



STYLE AND SIZES FOR ALL MACHINES ON WHICH THREADS ARE CUT

## *On Brown and Sharpe,* **AND OTHER AUTOMATICS**

### **INSERT CHASERS SAVE UP TO 33%**

Insert chasers are like safety razor blades: they cost so little that you can throw them away when dull. Or, for utmost economy, you can sharpen them over and over again. Only a flash grind is required. For approximately \$50 you get a dozen sets of  $\frac{3}{4}$ —16 insert chasers, each set ground ready to go. You will be amazed at the quantity of threads they will cut, even to Class 3 specifications, with a minimum of downtime. FREE: "UNIFIED AND AMERICAN SCREW THREAD DIGEST"

### **THE EASTERN MACHINE SCREW CORP.**

**40-50 Barclay St., New Haven, Conn.**

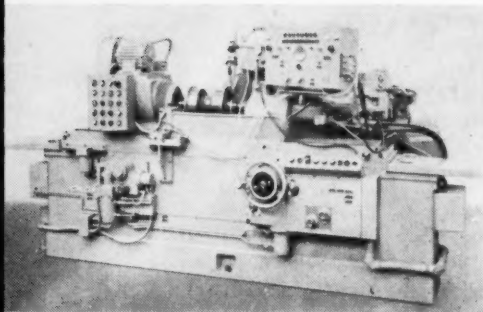
For more data circle 495 on Postpaid Card

## **ANGULAR WHEEL SLIDE GRINDERS**

Shoulders and shafts ground simultaneously, with critical dimensions, angles and corner radii established at the same time—this is the work cut out for one line of grinding machines, built by Cincinnati Milling Machine Co., Grinding Machine Div., Cincinnati 9, Ohio. These Filmatic Semi-

Automatic Angular Wheel Slide Grinding Machines, built in 6 inch R and 10 inch L and 10 inch R and 14 inch L sizes, have been specifically designed to combine o.d. and shoulder grinding in a single, fast, automatic cycle. Typical applications include crankshafts, steering knuckles, gear blanks with hubs and stepped shafts with critical flanges, tapers and shoulders. Built to feed at either 30 or 45 degrees, these machines make it easy to obtain a superior circular line finish, instead of a criss-cross finish.

Automatic Bebind - the - Wheel Profile Truing provides fast, accurate grinding wheel truing with provisions for two to 10 passes, with or without



*Cincinnati Angular Wheel Slide Grinder.*

diamond advance on the last pass. It may be set to true after a predetermined number of pieces have been ground.

Angular Wheel Slide Grinders are equipped with Cincinnati's self-adjusting Filmatic Bearings. The grinding

wheel spindle rides on a wedge-shaped cushion of high pressure oil, created by the interaction of the spindle and bearing shoes.

Operator convenience is an outstanding feature with the automatic infeed cycle. When the grinder is set for automatic operation, pressing the wheelhead advance button initiates an automatic cycle that hydraulically clamps the table, rapidly advances the wheelhead, starts work rotation, grinds at fast feed rate, grinds at slow feed rate, tarries, rapidly returns the wheelhead, stops work rotation and unclamps table.

Sizing adjustments as fine as 0.00005 inch on the work diameter are claimed to be possible because of the hydraulic motor drive of the infeed screws.

The all vee belt headstock drive assures smooth work rotation for high quality finishes.

For more data circle 103 on Postpaid Card

## People work better when they SEE BETTER<sup>®</sup>



**RCA LABORATORIES** researcher wears MAGNI-FOCUSER to work on new RCA semi-conductors that promise to break the Transistor "Heat Barrier."

### MAGNI-FOCUSER

**EDROY PRODUCTS CO., Dept. P, 480 Lexington Ave., New York 17, N. Y.**

For more data circle 496 on Postpaid Card

For increased production, greater accuracy, fewer accidents and errors, use the MAGNI-FOCUSER—the new 3-D binocular magnifier with matched prismatic lenses. It provides needle-sharp vision — *greatly magnified and in third dimension.*

Scores of industrial jobs are being aided by the MAGNI-FOCUSER. It reduces eye strain and avoids squinting; leaves both hands free to work. It's light weight; can be worn with or without eye glasses; normal vision resumed simply by raising the head.

Speed your production by ordering now on 10-day trial basis without obligation. Only \$10.50. Immediate delivery. Or write for illustrated folder.

the 3-D Magnifier that speeds production and leaves both hands free to work

# Satisfied?

that it's **PARALLEL?**

... **STRAIGHT?**

... **SQUARE? ... FLAT?**

You will be if you use "Milwaukee" Precision Equipment—Surface Plates, Straight Edges, Angles, Box Parallels. Standard of the industry!



## J. C. BUSCH CO.

Engineers & Machinists Since 1907

126 E. PITTSBURGH AVE.

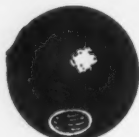
MILWAUKEE 4, WIS.

For more data circle 497 on Postpaid Card

# REID

## TOOL ROOM ACCESSORIES

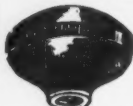
### CONTROL BALL HANDLES



Round Plastic



Oval Plastic



Mushroom Plastic

Designed for machine tools, jigs, fixtures, etc. Round and oval plastic types can be supplied in red and black. Made in many diameters and thread sizes. Can also supply highly polished steel ball handles.

**FREE 88-Page Catalog**

Send for it today. Lists 1800 items needed in every tool room such as hand knobs, compression springs, hand wheels, clamping handles, etc.

## REID TOOL SUPPLY CO.

MUSKEGON HEIGHTS, MICHIGAN

For more data circle 498 on Postpaid Card

252 MODERN MACHINE SHOP

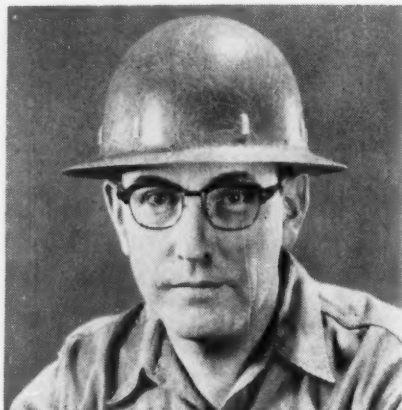
new equipment . . .

## SAFETY PRODUCTS LINE NOW INCLUDES HARD HATS

Bausch & Lomb Optical Co., 893 St. Paul St., Rochester 2, N. Y., introduces a complete line of safety hats and caps. The headgear is available in a choice of fibre-glass, aluminum and plastic (electrical), covering a full range of standard colors.

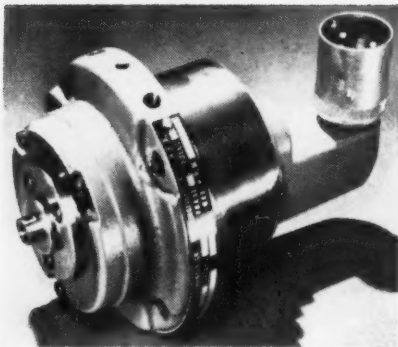
An outstanding feature of the hats is a new, contour-fit suspension which has been achieved by a unique design of pliable polyethylene.

The hats conform to the head, giving "soft-hat" comfort without top-heavy feeling. Lock straps assure minimum crown clearance of 1 1/4 inches, which can be increased. A numbered snap-in adjustment provides quick, easy fitting to any size from 6 3/8 to 8. Suspension may be left intact for cleaning and sterilization, but can easily be removed for replacement. Plastic-zippered sweat band can be taken out and replaced without affecting suspension. For more data circle 104 on Postpaid Card



Bausch and Lomb Fibre-Glass Safety Hat.

May, 1960



Bryant 800 Series High Frequency Spindle

### SPINDLE EXCHANGE PLAN

Bryant Chucking Grinder Co., Springfield, Vt., is offering an expanded Spindle Exchange Plan, which permits the trade-in of worn out or obsolete high frequency spindles (both Bryant and competitive makes) for

up-to-date 800 Series Bryant Spindles. This plan provides a \$100.00 exchange or trade-in allowance for any obsolete high frequency Bryant model, (or for any comparable high frequency spindle of competitive manufacture), on the purchase price of a new Bryant high frequency unit.

Hundreds of old Bryant High Frequency Spindles have already been exchanged for these new improved models under the previous plan which accepted only Bryant Spindles.

Use of these new spindles is said to substantially increase the productivity of internal grinders and other machines. The large shafts and bearings reduce deflections at the wheel or cutting tool; powerful integral motors maintain efficient cutting speeds.

All standard units, with speeds up to 150,000 r.p.m., use complete, replaceable bearings and quill-type shafts, thereby insuring the rapidity and low cost of repairs.

For more data circle 105 on Postpaid Card

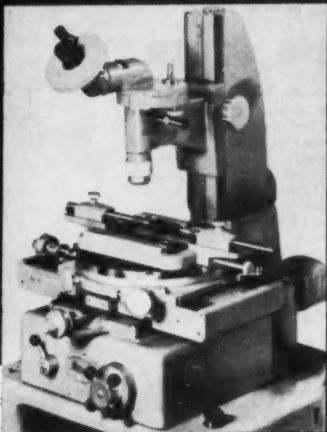
## A JOB THAT ONLY A — *Leitz* TOOLMAKER'S MICROSCOPE CAN DO!

Permits measurements in 2 dimensions plus checking of Radii, Concentric Circles, threads and angles.

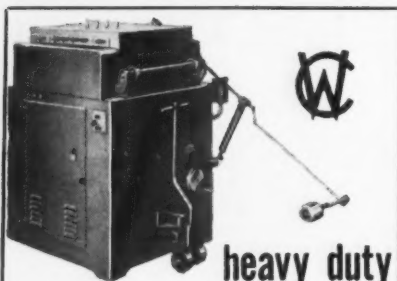
- Has exclusive intermediate image system which combines coordinate measuring microscope and optical comparator in one instrument.
- Built-in charts permit use in three magnifications.
- Reads to .0001" or to .00005" from Master glass scales in larger models.
- Available in 1" x 2", 1" x 4", 2.3" x 6", 6" x 6" and 8" x 40" capacity.

FREE BOOKLET—Write for new catalog.

**OPTO-METRIC TOOLS, INC.**  
137 MM VARICK STREET, NEW YORK 13, N. Y.



For more data circle 499 on Postpaid Card



## heavy duty stock straighteners

Cooper Weymouth power driven straighteners speed production in stamping, shearing operations by removing coil stock curvature at controlled speeds, efficiently and at low cost. Portable, cabinet type, take stock up to  $\frac{3}{16}$ " thick; made in stock width sizes of 12", 18", 24" and 36".

Send for data on this, other models.

**COOPER WEYMOUTH, INC.**  
605 Honeyspot Road, Stratford, Conn.

For more data circle 500 on Postpaid Card

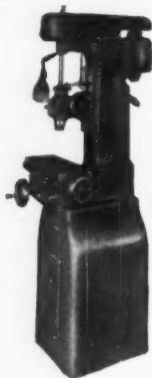
## UNEQUALLED

*For Small Jig Boring Jobs!*

### LINLEY JIG BORER

Made for small precision work found in all sized shops. Meets your most exacting requirements; releases large capacity borers for heavier jobs. Investigate the savings made possible with the Linley Jig Borer. An inquiry card mailed today will bring you detailed information promptly.

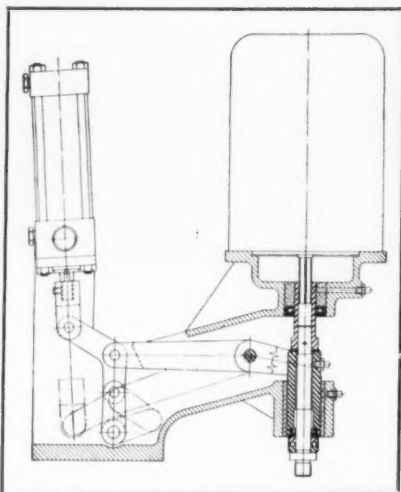
Table Size: 7"x17 $\frac{1}{2}$ "  
Table Travel: 6 $\frac{1}{2}$ "x10"



**LINLEY BROTHERS CO.**  
661 State St. Ext., Bridgeport 1, Conn.

For more data circle 501 on Postpaid Card

*new equipment . . .*



*Rivet Spinner Head for automation.*

### RIVET SPINNER HEADS FOR AUTOMATED ASSEMBLY LINES

Rivet spinner heads, specifically designed for automation, are being produced by High Speed Hammer Co., Inc., 315 Norton St., Rochester 21, New York.

These air operated, motor driven, spinner heads are self-contained units. A clean sweep underneath the mounting pad allows them to be set up in conjunction with dial feeds, or in any other way required for automatic assembly.

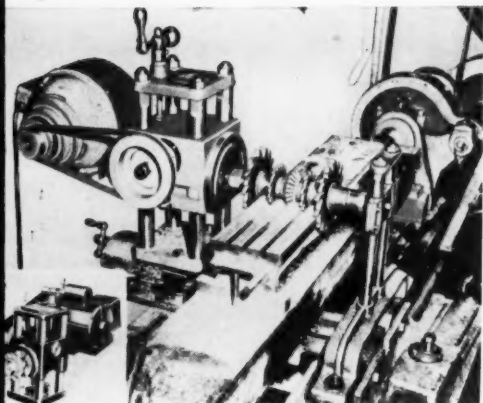
The Model E Spinner Head has capacity for  $\frac{1}{8}$  inch diameter rivets; Model G for  $\frac{5}{16}$  inch diameter rivets. For more data circle 106 on Postpaid Card

★ modern machine shop ★

### PORTABLE MILLING EQUIPMENT

Two new unit sizes, which permit more precise application, have been





Versa-Mil Model 1 (shown in the inset) is for smaller work. Model 3 with outboard arbor support is milling three slots and two sides of large machine table, all at same time.

added to the line of portable milling equipment manufactured by The Dumore Co., 1302 Seventeenth St., Racine, Wisconsin.

Called Versa-Mil Models 1 and 3, these additions broaden the capabilities of Dumore Milling Equipment to permit the milling, drilling, boring, shaping, slotting, grinding and related machining of small and medium, as well as large sized work. Dumore claims all units are so compact that they can be easily attached to any standard machine tool for secondary operations without moving the work-piece. Parts or machinery which are too big to move, or won't conveniently fit on standard tools, can be machined in place faster by taking the Versa-Mil to the job. The company also states that these units can be used independently in fixtured setups because of built-in power and feeds. For more data circle 107 on Postpaid Card

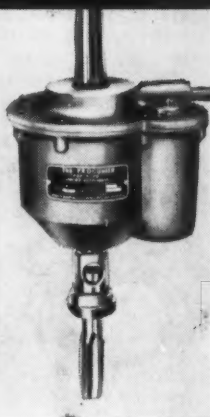
★ modern machine shop ★

#### **PNEUMATIC GRINDER**

Ideal for taking down rough spots or general grinding on either flat or

May, 1960

# **POWER!**



## **...FOR LARGE HOLE TAPPING**

The New Proconier Tap King represents a major advancement in large hole tapping units. Powerful, dependable, it can tap in steel up to 1½" thick—and hold a class 2 fit with ease! It combines heavy duty ruggedness with delicate precision, to give you the best all 'round BIG tapper for BIG jobs! Operators like its super-sensitive action—management appreciates the many cost-saving features—including longer tap life, consistently uniform threads, fewer spoiled pieces. It consistently turns out more higher quality work in less time, with less effort. Where cost counts and precision is paramount—the TAP KING is the tapper for you!

#### **Write for FREE Circulars**

Get the whole story on this remarkable unit, the full line of Proconier Tappers and the New Lead Screw PUSH BUTTON TAPPER. They're Free!



## **PROCONIER SAFETY CHUCK CO.**

12 S. Clinton St. • Dept. 5 • Chicago 6, Illinois  
For more data circle 502 on Postpaid Card

MODERN MACHINE SHOP 255

**new equipment . . .**

curved surfaces, Airetool Mfg. Co., Springfield, Ohio, announces that its Model 700-V Vertical pneumatic grinder has been further improved by the addition of a revolving cup wheel guard, which affords greater protection for the operator and permits better observation of work being done. The tool may also be obtained with



*Model 700-V Vertical Pneumatic Grinder.*

**Spra-Kool**

**MIDGET  
MIST-COOLANT  
GENERATOR**

**\$995**

Complete  
**GUARANTEED  
PERFORMANCE**

Order Sample or Write for Bulletin

**BAR PRODUCTS CO.**

4803 WHITE OAKS AVE. ROCKFORD, ILL.



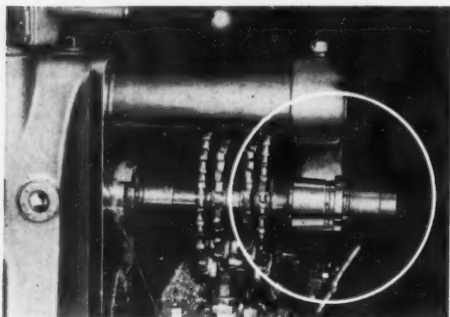
For more data circle 503 on Postpaid Card

a stationary, adjustable cup wheel guard.

Handles make it easy to maneuver the grinder and keep it under control in any position and at any speed, while using it for either grinding, sanding or wire wheel work.

The Model 700-V Vertical Pneumatic Grinder weighs only 11 pounds

**Replace the bronze bushing in your  
MILLING MACHINE ARBOR SUPPORT  
with a Sonnet ROLLER BEARING**



Installed in minutes without machine rework. Requires no extra space; no adjustments. Extra sets of bushings provided to accommodate different size arbors. Permits full range of speeds and feeds of late model milling machines. Carbide cutters can be fully utilized.

- Faster speeds and feeds
- Maximum rigidity
- No chatter
- No bearing heating
- No bearing seizure
- No twisted arbors
- Longer cutter life
- Utilizes machine's lubrication system
- Increased production
- Better finishes
- Less maintenance
- Faster set-ups

*Write for catalog!*

**SONNET**  
**TOOL & MFG. CO.**  
580 North Prairie Avenue  
Hawthorne, California

For more data circle 504 on Postpaid Card

and uses a 6 inch wheel or brush. It can be obtained with air motors which operate at speeds of either 4,500 or 6,000 r.p.m. This grinder is balanced to operate evenly and smoothly with little pressure from the operator.

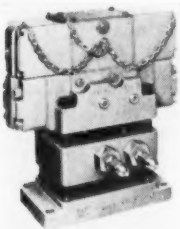
For more data circle 108 on Postpaid Card

★ modern machine shop ★

### PIPELESS FLOW CONTROL VALVE

A  $\frac{3}{4}$  inch dual flow control valve with integral check is announced by Double A Products Co., Manchester, Mich.

The Model YP-175 is a non-pressure - compensated valve that provides for separate, adjustable metering-out of fluid in both cylinder lines. It is one of a new series of valves carrying the name CircuitStak, and is installed by being sandwiched between a  $\frac{1}{2}$ ,  $\frac{3}{4}$  or 1 inch solenoid controlled, pilot operated valve and the sub-plate. The stacking of circuit components in this



Flow Control Valve

manner eliminates all interconnecting pipes and permits additions to the circuit without panel alteration or piping.

For more data circle 109 on Postpaid Card

★ modern machine shop ★

### INSIDE SQUARE SURFACE PLATES

A new type of precision granite surface plate, designed for rapid three dimensional checking, is available from Herman Stone Co., 1860 North Gettys-

## Stocker & Yale Machine Tool Optical Projector

# OPENS A WHOLE NEW DIMENSION IN PRECISION PRODUCTION

Typical lathe application →  
South Bend

Vertical or horizontal models.  
Standard magnifications of 10X,  
20X, 31.25X, 50X, 62.5X,  
100X. Measures in increments  
of .001" or .0001".



*Reduces costs* — cuts machine downtime, saves operator time, speeds production, reduces scrap, speeds operator training. *Improves quality* — eliminates transfer errors, allows working to layout, permits seeing and measuring stock removal. *Broadens market* — allows you to do work you otherwise would not be able to do.

Readily attaches to most machine tools. Allows continuous and precise magnified checking, direct measurement, and comparison of work in process to transparent overlay charts. Gives a clear, sharp, high-contrast image . . . accurate, easy to see, easy to work with.

Portable. Easily converted from one application to another . . . or may be permanently mounted. Set-up time is merely a matter of minutes.

We guarantee the Model 7M will return more than your investment in short order!

## STOCKER & YALE

Optical Projection Equipment — Lite-Mite Supplementary Lighting

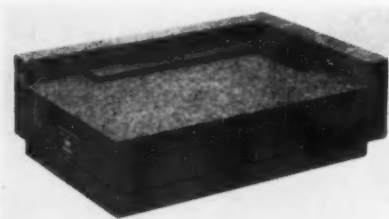
Want ☐ Demonstration ☐ Optical Projection Methods Engineering Details? ☐ Catalog on Machine Tool Projector Model 7M

Clip and attach to your letterhead. Sign and mail to:

STOCKER & YALE, INC., 50 Green Street, Marblehead, Mass.

For more data circle 505 on Postpaid Card

**new equipment . . .**



**Herman Stone Inside Square Surface Plate**

burg Ave., Dayton 27, Ohio. This special line of surface plates will speed up checking operations by providing accurate angles that allow two or three sides of a precision part to be checked simultaneously.

Inside square plates may be produced with one or two vertical sides. All angles formed by the sides and the base are held to an accuracy of

90 degrees, plus or minus 3 seconds. These plates are manufactured of true quartz granite to assure long life and dimensional stability.

For more data circle 110 on Postpaid Card

★ modern machine shop ★

**AUTOMATIC RAM TURRET LATHE**

Gisholt Machine Co., Madison 10, Wisconsin, introduces an automatic ram type turret lathe. Called the Gisholt Masterline AR Turret Lathe; "A" for automatic and "R" for ram; Gisholt claims to have transformed the "work horse of the shop" into a full-fledged automatic lathe for both bar and chucking work.

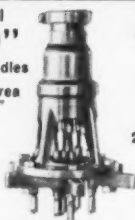
Two models are available. The 4AR within a 2 inch bar stock capacity and the 5AR with a bar stock capacity of 2½ or 4½ inches. Except for infinite feed selection (within a range of ¼ to 120 i.p.m.) for the hexagon turret ram and the cross slide, machine capacity and operation are similar to

**For LOW COST Hole Production**

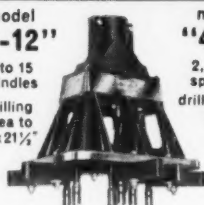
model  
"900"  
2 to 8 spindles  
drilling area  
to 22½"



model  
"500"  
2 to 6 spindles  
drilling area  
to 18½"



model  
"8-12"  
2 to 15  
spindles  
drilling  
area to  
25¼" x 21¼"



model  
"400"  
2, 3 or 4  
spindles  
drilling area  
3½"



model  
"3-22"



2 to 15  
spindles — drilling area to 35½"

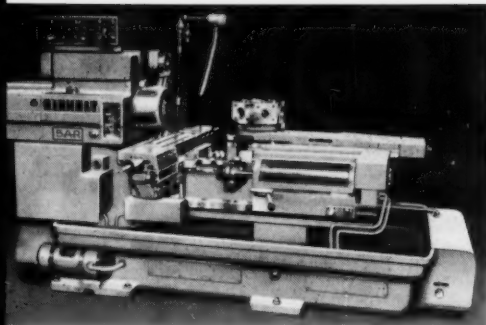
**Pick a MULTI-DRILL to Fit the Job**

Commander MULTI-DRILLS — adjustable multiple spindle drill press attachments—are sold and serviced by a nation-wide network of Commander Distributors—experienced, helpful specialists in solving drilling and tapping problems. Write for the name of your nearest Distributor and the complete Commander Production Tool Catalog which contains full details on every MULTI-DRILL and many other production drilling and tapping tools.

**Commander MFG. CO.**

4224 WEST KINZIE STREET  
CHICAGO 24, ILLINOIS

For more data circle 506 on Postpaid Card



*Masterline Automatic Ram Turret Lathe.*

the standard manually operated ram type turret lathe. Construction features are also the same.

According to Gisholt, the AR Turret Lathe combines automatic cycle efficiency with the versatility and quick setup of the hand operated ram type turret lathe. Except for cycle pro-

gramming, which can be learned by an experienced operator or setup man in a day, setup is the same as for the standard ram type turret lathe. Spindle speed selection and such machine functions as back feed, right or left hand threading, manner of cross slide operation and collet chuck and bar feed operation are preset.

For more data circle 111 on Postpaid Card

**CAM MILLING**
**JIG BORING**



A SPECIALIZED CAM  
MILLING SERVICE.  
JIG BORING  
... SPOT WELDING  
... CONTRACT PRODUCTION  
EXPERIMENTAL DEVELOPMENT

**CAM CALCULATING SERVICE**

**EISLER ENGINEERING CO., INC.**  
734 S. 13TH ST., NEWARK 3, N. J.

For more data circle 508 on Postpaid Card

# NUMBERALL

CUTS THE COST OF STAMPING NUMBERS

## AUTOMATIC NUMBERING HEAD

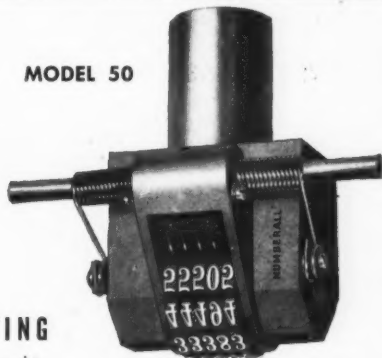
**STURDY/ACCURATE/LONG LASTING**

Rapid consecutive character wheels advance automatically after each stamping. Clear, uniform impressions. Wheel and index plate one piece unit, sturdier . . . greater uniformity. Index plate cannot become loose or out of alignment. Wheels available with Round Face characters for low-strain marking. Write for bulletin 50N.

**NUMBERALL STAMP & TOOL CO.**  
**HUGUENOT PARK STATEN ISLAND 12, N. Y.**

For more data circle 507 on Postpaid Card

**MODEL 50**



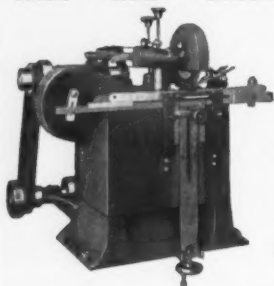
**TO NUMBER  
METAL  
PRODUCTS**

## PAYS FOR ITSELF

With Profits from Resharpener  
1 Gross of Hack Saw Blades.

**SHARPENS • RECLAIMS  
AUTOMATICALLY**

**HACK • BAND • CIRCULAR SAWS**



Write  
For  
NEW  
1960  
Catalog  
Today

Model EC  
Combination  
Bench Type

# WARDWELL

Manufacturing Co.

3803 Ridge Road • Cleveland 9, Ohio

For more data circle 509 on Postpaid Card

## Precision Tapping

*by hand or machine with*

**DAHLSTROM  
TAP GUIDE**

A low-cost Dahlstrom Tap Guide provides the accuracy and close tolerances of large, expensive machines. Tap breakage, is virtually eliminated because material is always held straight and square. Light enough for portability, yet it can be bolted permanently to wall or post.

saves countless hours  
by preventing  
broken taps.



### Machine Tapping

The spindle top is center-bored to fit the tail stock of a lathe. Simply pull out for lathe use. Same spindle can be used as a tap extension for reaching difficult places. Furnished with 9 adaptor sizes: 8-32; 10-24; 1/4", 5/16", 3/8", 7/16", 1/2", 5/8", and 3/4". Write for bulletin.

**\$89.50 F. O. B.  
FACTORY**

**BRANCH MFG. CO.**

15 Olson Drive,  
North Branch, Minn.

For more data circle 510 on Postpaid Card

260 MODERN MACHINE SHOP

new equipment . . .

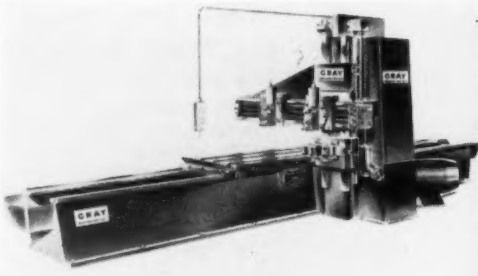
## PLANER DESIGNED FOR MODERN FAST CARBIDE PLANING

Responding to the need for a maximum performance planer in the low price field, The G. A. Gray Co., Dept. N-202, Cincinnati 7, Ohio, is offering the Gray Flying Scot—a small planer that combines outstanding productivity and low cost with high quality.

The Gray Flying Scot is available in nine combinations of table widths and heights—basic sizes are 30, 36 and 42 inches. It features rugged components, engineered to resist torsional deflection and vibration under the heaviest of cuts in either direction. The wide face on the column, the rail and the rail heads are all square locked. This design rigidly resists the forward and reverse thrusts produced in double cutting.

The new Helicone transmission is an unusually simple drive, is self-contained and provides a smooth, non-pulsating motion to the table on long, as well as short, strokes. It is, therefore, ideal for carbide planing. The angled helical bull gear has a minimum of three teeth in mesh with the helical rack, the angle of which is such that there is no side thrust on the table—a balanced vibrationless drive.

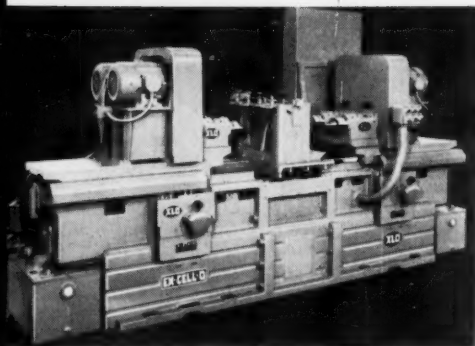
For more data circle 112 on Postpaid Card



This Gray Flying Scot Planer is compact.

May, 1960





Way Type Precision Boring Machine.

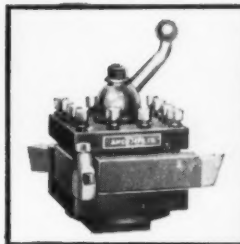
### PRECISION BORING CRANKCASES FOR AIR COOLED ENGINES

A standard two way precision boring machine, built by Ex-Cell-O Corp., Detroit 32, Michigan, does one of the most critical operations performed during the machining of any four cycle gasoline engine, the precision boring of crankshaft and camshaft bearing diameters. Two workpieces are involved, one right hand, one left. The Ex-Cell-O designed fixture accommodates both aluminum alloy components interchangeably. Changeover from one batch to another involves only a change of boring quills.

In operation, two workpieces are manually loaded. Location is taken from two previously bored dowel holes. The clamps are swung into closed position and locked hydraulically. The left slide rapids into working position and precision boring of the camshaft hole is performed, in addition to facing the boss and chamfering. Tolerance on hole diameter is held within 0.0005 inch.

The crankshaft bearing diameter is precision bored from spindles that are mounted on the right slide. Here a counterboring and chamfering operation is also performed. The hole diameter tolerance is held within 0.0003 inch. This cycle of precision op-

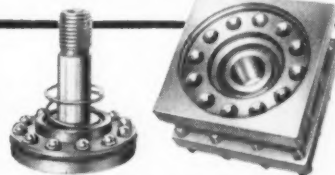
## Enco Turrets Assure $\pm .0005''$ Accuracy



by  
being  
on the  
ball!



Enco's passion for exacting accuracy is paying off in metal working operations everywhere! Combining precision lathe output with efficiency and economy has become a necessity . . . and Enco turrets have proved the ideal answer. An Enco turret transforms one lathe into a production machine, each operation of unsurpassed accuracy due to *spring loaded ball design!*



Spring loaded balls give you the accuracy you want! Hardened steel precision balls locked between accurately milled spherical seats consistently give accuracy in re-indexing. Hardened all steel construction minimizes wear, retains built in precision.

Also Mfrs. of Enco Hexturret Bed Turrets

Write today for catalog No. 53.

There's an ENCO turret for every lathe.

**Enco** MANUFACTURING CO.

4520 West Fullerton Avenue  
Chicago 39, Illinois Dept. 150

For more data circle 511 on Postpaid Card

MODERN MACHINE SHOP 261

## new equipment . . .

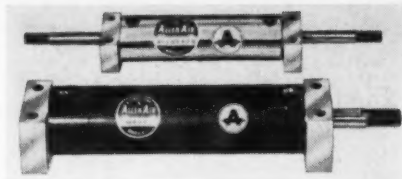
erations is made in a total time, including load and unload, of only 27 seconds, achieving a gross production of 266 parts per hour.

For more data circle 113 on Postpaid Card

★ modern machine shop ★

## AIR AND HYDRAULIC CYLINDERS

Allenair Corp., 255 East Second St., Mineola, N. Y., introduces a line of



Type "AS" Air and Hydraulic Cylinders.

air and hydraulic cylinders, known as Type "AS". They are available in bore sizes of  $\frac{7}{8}$ ,  $1\frac{1}{8}$ ,  $1\frac{1}{2}$  and 2 inches, as either double acting or spring return, as well as double ended or single ended.

The cylinders feature one-piece square heads, ground and polished stainless steel rods, nylon bearings and honed brass or steel tubes. Cushions are optional and a choice of packings is available. The units are stocked in inches of stroke up to 20, but any stroke is available up to 168 inches.

For more data circle 114 on Postpaid Card

★ m m s ★

## KEY KIT

Allen Mfg. Co., Hartford 1, Conn., introduces a convenient key kit that holds hex-socket screw keys in a wide

# Progressive Carbide Users

## Select by *Performance*

# ...not habit!

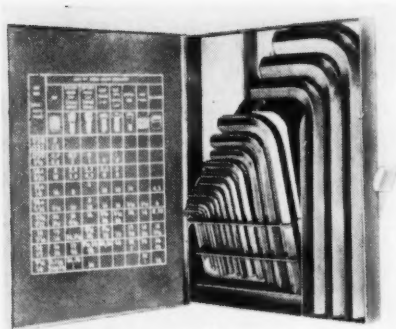
Producers of  
Tungsten Carbide Tools,  
Tool Tips,  
Dies, Wear Parts,  
Dex-A-Tool

A

### ADAMAS CARBIDE CORPORATION

KENILWORTH, NEW JERSEY

For more data circle 512 on Postpaid Card



Allen Manufacturing No. 667 Key Kit.

range of sizes to fit all except the largest diameter Allen Hex-Socket Screws.

The No. 667 Allen Key Kit holds 18 genuine Allen Hex Keys in a compact, sturdy metal box measuring only  $5\frac{3}{4}$  by  $7\frac{1}{2}$  by  $\frac{3}{4}$  inch. Keys range from the smallest (0.028 inch) through

$\frac{5}{8}$  inch hex diameter and fit all Allen Hex-Socket Screws in that category. The kit also includes new  $7/64$  and  $9/64$  inch sizes for No. 6 and No. 8 "60" Series Cap Screws.

The inside cover of the box has a Key Fit Table that shows at a glance the correct key size for each Allen socket screw product. The kit makes it convenient for the worker to keep keys together right at the bench or on the job. A rack inside the metal box tilts keys outward for quick and easy selection.

For more data circle 115 on Postpaid Card

★ modern machine shop ★

### ALL PURPOSE LINE OF PORTABLE NIBBLERS CUTS HEAVY AND LIGHT GAUGE METALS

Manufactured by Fenway Machine Co., Inc., 3107 North Broad St., Philadelphia 32, Pa., a line of portable nibblers is said to be proving quite

## HUPPERT

### Floor Model Furnaces

Built in 28 Standard Sizes

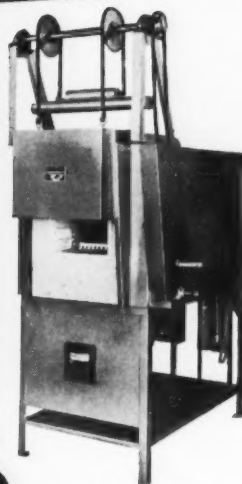
- Continuous operation to 1850°F.—intermittent to 1950°F.—for 2300°F. on special order.
- Complete with indicating electronic controller.
- Tight-sealing, wedge-type door.
- Standard for 220 V. AC, single or 3 phase operation—110 V. or 440 V. on special order.
- Multi-insulation for maximum efficiency.

Request literature  
on complete line of Huppert Furnaces

Model No. 16 Illustrated

**K. H. HUPPERT CO.**  
Manufacturers of Electric Furnaces and Ovens

6841 Cottage Grove Ave., Chicago 37, Illinois



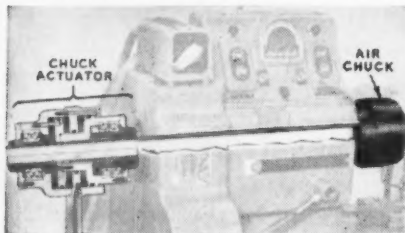
Inside Dimensions  
12" W. x 8" H. x 18" D.  
**\$1050.00 complete**

For more data circle 513 on Postpaid Card

## new equipment . . .

versatile on a variety of cutting jobs—in the field, as well as in the shop. Cutting capacities of these units range up to  $\frac{1}{4}$  inch cold or hot rolled steel and 5/16 inch aluminum. Both air and electric powered models are available for cutting all non-ferrous metals such

### Revolutionary New Chuck and Actuator!



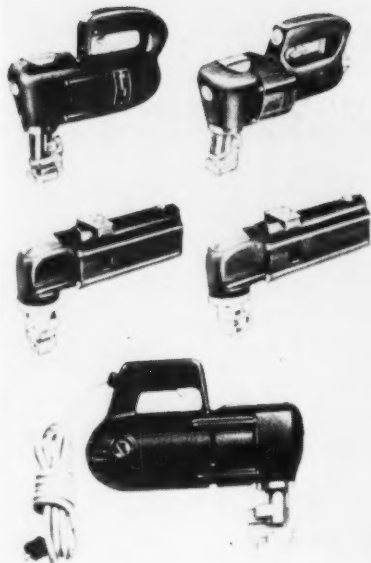
Safe, proven Gamet Air Chuck and Power-grip Chuck Actuator installs easily on your lathe. Saves money—gets results. Makes it possible for you to:

- Use lathe for both bar and chucking work.
- Use the draw tube hole for coolant, or tools.
- Eliminate air leaks and reduce fly-wheel effect.

Guaranteed for One Year. Chuck Size  $4\frac{1}{4}$ " to 14".

### POWER GRIP, INC. ROCKFALL, CONN.

For more data circle 514 on Postpaid Card

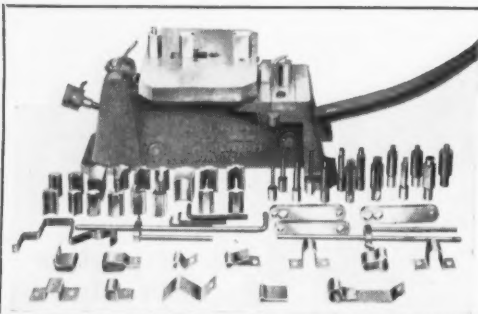


All Purpose Line of Portable Nibblers.

as copper, brass, aluminum, 10 gauge stainless steel and corrugated metal.

According to the manufacturer, each model cuts without distortion to the material, leaving sheared edges burrless; smooth edges do not require any extra finishing.

Operator safety is an integral feature because of the unique punch



### Multiform BENDER CUTTER

Users report the Multiform Bender one of the handiest tools in the shop. No special tooling . . . Bends, Cuts, Punches, Flats, Rounds into Any Shape, Brackets, Springs, Busbars, Wire Forms, Aircraft Work, and Steel Rule Dies for Metal Blanking.

**AIR OR HAND MODELS FOR UP TO  $\frac{1}{4}$ " to 4" MATERIAL**

Write for brochure which illustrates and describes the four bender models.

**J. A. RICHARDS CO.**

Dept. 6-M

Kalamazoo, Mich.

For more data circle 515 on Postpaid Card

and die operation. It is impossible for the operator's fingers to come in contact with the cutting action and, when a "bite" is taken, the cut pieces drop down instead of being hurled upward, thus protecting operator's eyes from injury.

Air powered models are recommended for operation in critical areas, such as oil refineries and chemical plants, where either a torch or an electric tool is prohibited.

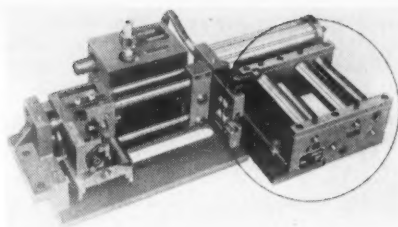
For more data circle 116 on Postpaid Card

★ modern machine shop ★

### ECONOMY STOCK STRAIGHTENER

A low cost coil stock straightener has been added to its line of press room accessories by Cooper Weymouth, Inc., 605 Honeyspot Rd., Stratford, Connecticut.

Known as the Economy Stock Straightener, it is non-powered and

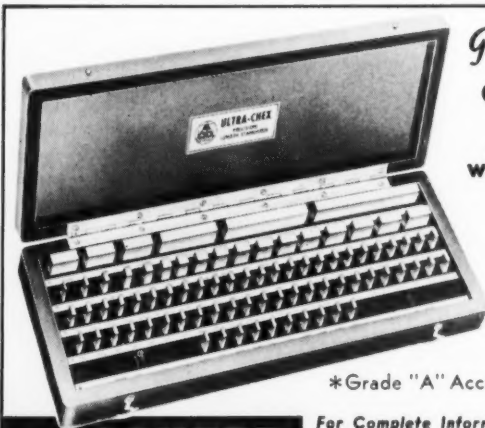


Economy Coil Stock Straightener features Cooper Weymouth Air Operated Feed.

can be used with almost any automatic feed. Four hardened and ground straightening rolls take the curvature from coil stock, delivering it smooth and flat to the press.

These units are manufactured in three stock width sizes of 6, 12 and 18 inches and have maximum capacities ranging from 6 inches by 0.125, mild steel, in the 6 inch size, to 18 by 0.045 in the largest model.

For more data circle 117 on Postpaid Card



Gage Block Precision means  
GRADE "A" ACCURACY\*

with **ULTRA-CHEX**  
**GAGE BLOCKS**

**82 PIECE SET...**

**NOW ONLY \$249<sup>50</sup>**

\*Grade "A" Accuracy:  $-.000002$ " and  $+.000006$ "

For Complete Information request our 96 Page Catalog — Contact any of our 4 "Coast to Coast" Locations or your nearest Local Distributor.



**SCHERR  
TUMICO**

**PRECISION MEASURING  
TOOLS AND INSTRUMENTS**

WAREHOUSE STOCK, SHOWROOMS & SALES OFFICES AT  
NEW YORK: 200 Lafayette Street, New York 12, N. Y.  
ST. JAMES: St. James, Minnesota  
LOS ANGELES: 3337 West Olympic Blvd., Los Angeles 19, Cal.  
CHICAGO: 5045 W. Harrison, Chicago 44, Ill.

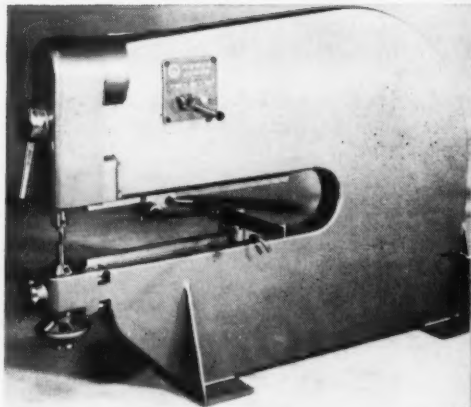
When writing to any of the above locations, refer to DEPT C-5

For more data circle 516 on Postpaid Card

**new equipment . . .**

### **PLATE AND SHEET WORKING MACHINE**

Homstrand Machine Tool Corp., 392 West Putnam Ave., Greenwich, Conn., announces the Metal Worker, Type Junior, a sheet and plate working machine with an edge cutting capacity in mild steel of 5/32 inch.



*Junior Sheet and Plate Working Machine.*

SAVE  
**• TIME • MONEY •**  
**• LABOR • MATERIAL •**  
*With H & H precision tube bending dies*

**Bending Form   Wiper Die   Flex-Rite Mandrel**

H & H Engineering now offers a complete line of high-quality tube bending tooling . . . assure production of precision bends with a minimum of set-up time and material spoilage.

**Today**—write for brochure and price lists

**H & H ENGINEERING CO.**

131 Summit Boulevard • Englewood, Colorado

For more data circle 517 on Postpaid Card

The Junior, which has a throat depth of 28½ inches, was designed for model shops, engineering departments and research and development labs.

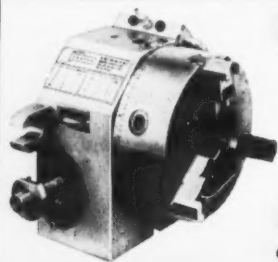
A full line of tooling is available for straight cutting, circle cutting, figure cutting, beading, folding, slot cutting, louversing, nibbling, planishing and flanging.

For more data circle 118 on Postpaid Card

★ modern machine shop ★

### **NUMERICAL DEPTH CONTROL FOR PRECISION BORING**

Fosdick Machine Tool Co., Cincinnati 23, Ohio, announces that numerical depth control is the latest option



### **Dugas "AIR FLASH" SPACER**

Air operated high speed compact spacer for your automatic set-up yet versatile enough for short run job.

Write for complete information, specification and price list.

**DUGAS MACHINE WORKS, INC.**

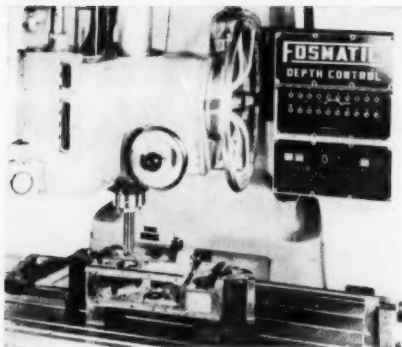
617 YUMA COURT



DALLAS 8, TEXAS

For more data circle 518 on Postpaid Card





Fomatic Precision Boring Machine is shown equipped with numerical depth control.

offered for Models 44 and 54 Fomatic Precision Boring Machines. It adds the third automatically controlled dimension to precision boring.

Equipped with Fomatic numerical positioning (x and y axes) and depth (z axis) control, Fomatic Models 44 and 54 become production machines of great versatility. They will be used especially for small lot boring jobs requiring accuracy to plus or minus 0.0001 inch. The "jig borer" label is no longer broad enough to describe these machines, since their use in production work eliminates the need for jigs and fixtures on many jobs.

All control hardware and circuitry mounts on the machine and within the standard Fomatic numerical control console. Accurate depth programming

is exceptionally easy with the Fomatic system because it is necessary to know tool length only to the nearest 1/2 inch.

Tool compensation takes only about one minute per tool and is performed only once, to a zero reference. A "tool compensator" is mounted on the machine head. The same system is also used to adjust for tool wear.

For more data circle 119 on Postpaid Card

how to get . . .

## faithful 3-dimensional reproduction

in steel, other metals and plastics

Use the LOW COST precision-built Preis Panto 3D-5 Engraving Machine. Does both 2 and 3 dimensional engraving effortlessly.

- Reversible spindle for enlarging or reducing from a model, die or sample
- Precision ball bearings thru-out
- Reduction ratio range: 1.6:1 to 7:1
- Four spindle speeds—7,000 to 18,000 RPM
- Micrometer adjustment collar
- Provided complete with floor stand and work tables



TRADE MARK



Write for complete details and prices. For immediate attention write directly to manufacturer below. Ask for nearest representative.

**H. P. PREIS ENGRAVING MACHINE CO.**  
657 U.S. Route 22, Hillside, N. J.  
For more data circle 520 on Postpaid Card



## DYKEM STEEL BLUE

### Stops Losses

making Dies and  
Templates

Popular package 8-oz. can fitted with Bakelite cap holding soft-hair brush for applying right at bench; metal surface ready for layout in a few minutes. The dark blue background makes the scribed lines show up in sharp relief, prevents metal glare. Increases efficiency and accuracy.

Write for sample on company letterhead  
**THE DYKEM COMPANY**  
2301F North 11th St. • St. Louis 6, Mo.



SPECIMEN

With DYKEM Steel Blue



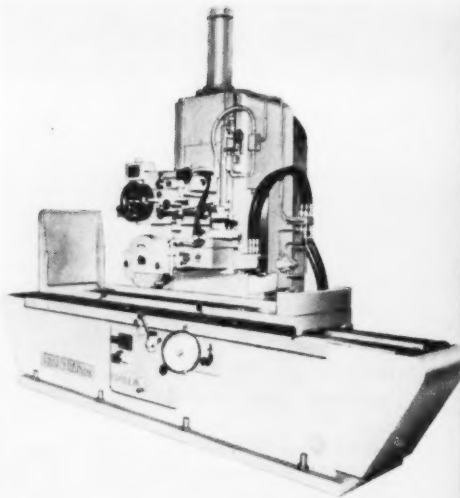
Without DYKEM Steel Blue

For more data circle 519 on Postpaid Card

*new equipment . . .*

**SURFACE GRINDING  
MACHINE IS  
TRACER CONTROLLED**

A tracer controlled, hydraulic feed surface grinder, designed to automatically reproduce transverse forms on large pieces, is introduced by Gall-



*Surface Grinder is tracer controlled.*

**CONTINUOUS HINGES**

*Manufactured by*

**AUTO MOULDING  
& MFG. CO.**

*WRITE FOR CATALOG*

1114 E. 87TH ST.      CHICAGO 19

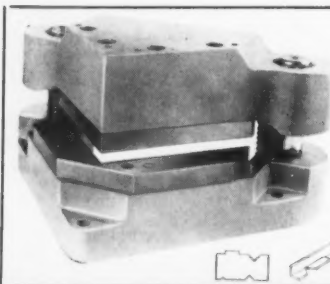
For more data circle 521 on Postpaid Card

meyer & Livingston Co., 408 Straight Ave., Southwest, Grand Rapids, Mich.

The new tracer control is particularly suited for use on forms too large for grinding with a single formed wheel and for materials requiring diamond wheels, where the cost of formed wheels is prohibitive.

The tracer controlled grinder is equipped with an automatic cross feed and automatic down feed.

The automatic cross feed, moving the wheel across the work, can be preset to feed from 0.008 to 0.040 inch



**TOOLSET® NOTCHING UNITS**

For press brake or punch press operations. Models are available with 5½ inch shut height and 2½ inch die height, or 8½ inch shut height and 3½ inch die height. Notch capacity up to 5 by 5 inches. Material capacity up to ¼ inch thick mild steel. Special radius or corner notches can be furnished.

*Write for catalog or quotation.*

**TOOLSET, INC.**

1411 MILITARY ROAD • BUFFALO 17, N. Y.

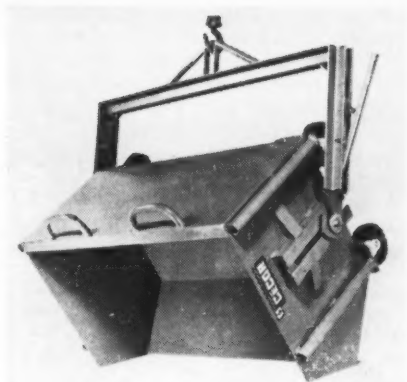
For more data circle 522 on Postpaid Card

at each table reversal and has a total travel up to the full width of the work table. The cross travel automatically reverses and feeds the work in the opposite direction and, if the automatic down feed is engaged, the cross travel signals it to begin operation.

The automatic down feed is used when the piece is so deep that it is not feasible to reproduce in a single pass. It removes only a preset amount of material—adjustable from 0.0025 to 0.060 inch—from the piece each time the grinding wheel traverses the width of the work. It is equipped with an automatic stop, so maximum form depth can be preset and, when this depth is reached, down feed automatically disengages.

The foregoing features make it economically feasible to grind forms in large pieces, particularly work of the new, harder and difficult-to-grind materials.

For more data circle 120 on Postpaid Card



CeCOR Model 43D Trigger-Dump Cart.

#### TRIGGER DUMP SPEEDS SCRAP HANDLING

Dumping chips, scraps, waste or small parts directly from a side-loading dump cart is speeded up with the



**OFFSET  
BORING HEADS**



UNPARALLELED

- ACCURACY
- RIGIDITY
- SIMPLICITY
- DURABILITY

REPEAT TO .0001"  
IN 30 SECONDS  
WITHOUT BACKLASH!  
CAN BE ADAPTED  
TO FIT ANY  
MACHINE

100% GUARANTEED! WRITE FOR CATALOG!

**PRECISION**

PRECISION TOOL & MFG. CO. OF ILLINOIS  
1305 SOUTH LEXAMIE AVE., CICERO 30, ILL.

For more data circle 523 on Postpaid Card  
May, 1960

#### SAVE - MONEY - TIME - ENERGY



#### LEXCO HYDRAULIC LIFT TABLES

Capacities 500# to 10,000#

Portable, adjustable height, Hand or Foot Operated. For lifting and transporting heavy castings, dies, etc., to machines and Presses.

Also DIE HANDLERS—STRIP STOCK HANDLERS

**Lexco** ENGINEERING  
& MFG. CORP.  
20 W. Chestnut St. • Souderton, Pa.

For more data circle 524 on Postpaid Card  
MODERN MACHINE SHOP 269

## new equipment . . .

use of a hoist frame fitted with trigger release, manufactured by Coolant Equipment Corp., Verona, Wis. The frame latches easily and securely to the cart. At dumping level, pressure on the spring trigger overturns the cart, which swivels through a full 360 degrees for complete emptying of the

### RIVETERS . . .

# GRANT

**PIONEERS  
and  
PACEMAKERS  
in their  
line**



—head rivets from smallest to 3/4" diameter cold steel, either by NOISELESS SPINNING or VIBRATING HAMMER method — fast, economically — types include Vertical and Horizontal Spindles, foot-power or automatic.

Free estimates of your work.  
Write for catalog today.

**THE GRANT MFG. & MACHINE CO.**  
96 Silliman Ave.      Bridgeport 5, Conn.



For more data circle 525 on Postpaid Card

contents. Dumping frame is available with pockets for use with fork lifts.

The Model 43D Dump Cart, of welded 12 gauge steel construction, carries up to 500 pound loads. A low, reinforced side makes manual or automatic loading easy. Four 5 inch swivel casters, removable handle, which fits sockets at either end of the cart, and two permanently mounted side handles increase the mobility, as well as the versatility, of the unit.

For more data circle 121 on Postpaid Card

★ modern machine shop ★

## HYDRAULIC PRESS STRAIGHTENS RAILS AUTOMATICALLY

Hydraulic Press Mfg. Co., Mount Gilead, Ohio, announces that its H-P-M Hydraulic Rail Straightening Press is designed to straighten, automatically, bends in railway rails having no more than 6 to 8 foot radii. By putting an outboard sensing device on the exit side of the press, it is possible to straighten longer bends by straightening the rail at 6 to 8 foot intervals throughout the bend.

Press consists of four cylinders, two with 200 ton pressure and two with 80. The 200 ton cylinders operate vertically; the 80 operate horizontally. All cylinders are located in the same frame, operating through the same center lines.

Rail is fed through the press by a conveyor system. Directions of bends



Patented

### WHY WASTE TIME?

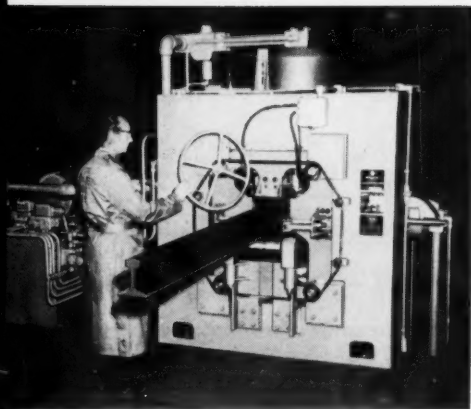
Dress Profiles like these in a few minutes without Templates or Crusher Rolls with the Jeon Automatic Angle Tangent to Radius Dresser. It's fully universal.

Write for Price and Folder.  
REPRESENTATIVES WANTED  
IN SOME AREAS

**JEON MANUFACTURING CO.**  
P. O. BOX 6750      WASHINGTON 20, D. C.



For more data circle 526 on Postpaid Card



*Hydraulic Rail Straightening Press.*

and their location in the rail are indicated automatically. When bends are located, conveyor automatically stops, the proper straightening ram is energized and the rail is straightened.

The press is equipped with pressure blocks which are adjustable to operate on 30 to 51 inch centers.

For more data circle 122 on Postpaid Card

★ modern machine shop ★

### TOGGLE CLAMPS HAVE 100 POUND HOLDING PRESSURE

Two miniaturized, vertical handle toggle clamps have been added to the



**Make 3  
hammers  
AT ONCE!**

It's the NEW, easy, economical, quick way to mold your own lead hammers on a production basis with "SHUR-GRIP" handles and this COOK production mold.

*Write for circular and prices*

**COOK LEAD HAMMER SERVICE**

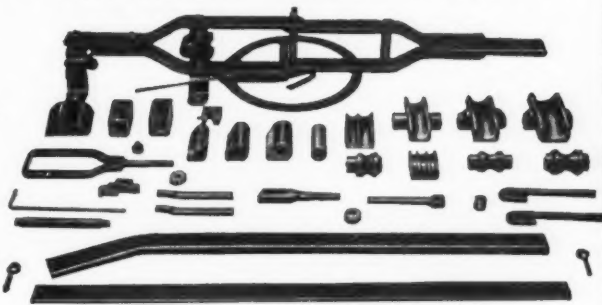
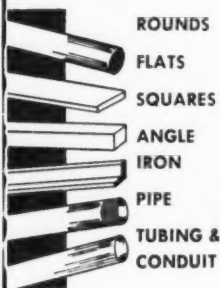
67 MASSASOIT AVE., EAST PROVIDENCE, R. I.

For more data circle 527 on Postpaid Card

## 1 MAN+1 BENDER

**BENDS ALL THESE:**

### HOSSFELD UNIVERSAL® IRON BENDER



• Wrenchless, ready to use. • Practical, quickly set up. • Adaptable, replaces special equipment. • Versatile, 147 different dies available. • Dependable, a must for maintenance, limited production. • Invaluable, optional equipment makes jobs easier.

Bender Shown With Regular Equipment

**FREE!** WRITE FOR  
BULLETIN

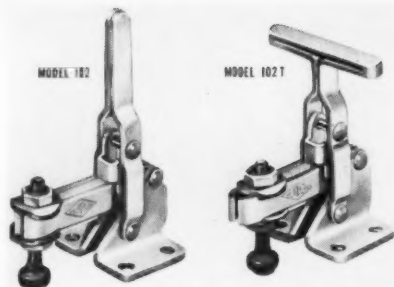
**HOSSFELD MFG. CO.**

404 W. Third Street, Winona, Minnesota

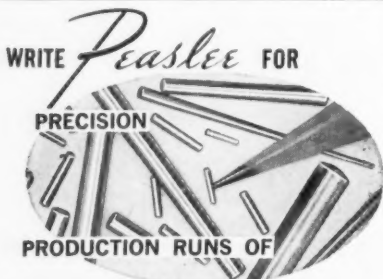
For more data circle 528 on Postpaid Card

**new equipment . . .**

standard line of clamps manufactured by Detroit Stamping Co., 350 Midland Ave., Detroit 3, Mich. Having a rated holding pressure of 100 pounds, they are available with either a straight vertical handle, designated Model 102, and a "T" handle, designated Model 102T. Both models are available with



Two new vertical handle toggle clamps.



WRITE *Peaslee* FOR

PRECISION

PRODUCTION RUNS OF

## TAPER PINS

DIAS. 9/0 to #4

As specialists in stainless-steel, instrument-type pins, we offer quantity runs of standard size Taper Pins. Tolerances are held to .001 on dia. Sizes run from #4 down to 9/0. Send your blueprints for prompt quotation.

### THE PEASLEE METAL PRODUCTS INC.

468 Tolland St. • East Hartford 8, Conn.

For more data circle 529 on Postpaid Card

a straight base, when desired. The clamps are designed principally for light duty assembly operations, where their small size and adjustable spindles are advantageous.

Base hole center distances are spaced to fit aircraft and electronic pegboard assembly fixtures. Both clamps are furnished with neoprene-tipped spindles. Stainless steel pivot pins are used to assure long wear and smooth operation. Cadmium plating is used to provide a tough, rust-proof finish.

For more data circle 123 on Postpaid Card

★ modern machine shop ★

### IMPROVED VERSION OF FABRICATOR

Wales-Strippit, Inc., 207 Buell Rd., Akron, N. Y., introduces a new model of its Strippit Fabricator. This ma-



IN 11 SIZES—No. 6 to 1"  
N.C. In all S.A.E. sizes.



*You Need an Extra Hand Now  
to Speed Up Production!*

### HEIMANN TRANSFER SCREW SETS

Here is the faster, more precise way of transferring open and blind screw holes—make savings in "wage-dollars-per hour" of your expensive hands on every job. A die-and-tool maker's tool with many other applications for die makers and machinists. A set of 6 Hardened Screws nested in combination holder and wrench—no other tools needed. Get more work now—save money tool

**HEIMANN MFG., CO. • URBANA, OHIO**

For more data circle 530 on Postpaid Card



chine is designed for punching, notching and nibbling, particularly for prototype work, short or medium production runs.

Designated as Model 15A, it features an electro-Hydraulic head which is the part of the machine controlling the power stroke of the ram. This new feature eliminates the need for pressurized air, required on earlier models. The elimination of the pressurized air has also permitted Wales-Strippit to simplify the design of the control mechanism. A relatively simple electrically controlled solenoid valve replaces the air motor, air motor valve, linkage and piping formerly required. Reducing the number of parts in the Electro-Hydraulic head makes the Model 15A easier to install and maintain. This, in turn, reduces the cost of installation, as well as operating costs.

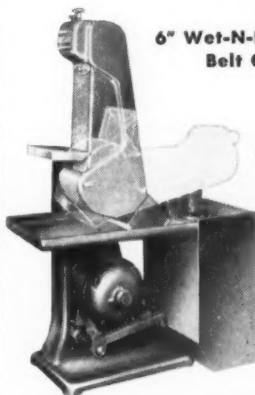
The Model 15A Strippit Fabricator punches round or shaped holes up to 3½ inches in diameter in any sheet material (including printed circuit boards) up to ¼ inch mild steel. Its maximum notching capacity is 5 by



**Model 15A Improved Strippit Fabricator**

May, 1960

*Hammond*  
**OF KALAMAZOO**



**6" Wet-N-Dri Abrasive  
Belt Grinder**

**For  
FLAT  
SURFACING**

- Castings
- Forgings
- Plastics

Vertical or  
Horizontal  
Operation

**WRITE FOR  
CATALOG**

*Hammond Machinery Builders*

1615 Douglas Ave., Kalamazoo, Michigan

For more data circle 531 on Postpaid Card



## **Chucking and Stub REAMERS IN DECIMAL SIZES Why Buy Specials?**

Thousands by  
the thousandths  
**IN STOCK**

IN EMERGENCY  
Telephone  
Libertyville  
**2-4200**

**SEND FOR CATALOG NOW!**



**TWENTIETH CENTURY  
MANUFACTURING CO.**

**BOX 429-MM**

**LIBERTYVILLE, ILL.**

For more data circle 532 on Postpaid Card

MODERN MACHINE SHOP 273

### **new equipment . . .**

5 inches in  $\frac{1}{8}$  inch mild steel and it will do straight line or contour shearing at 165 s.p.m. in  $\frac{1}{8}$  inch mild steel. The change from single stroke punching to 165 s.p.m. nibbling is effected by a single toggle switch.

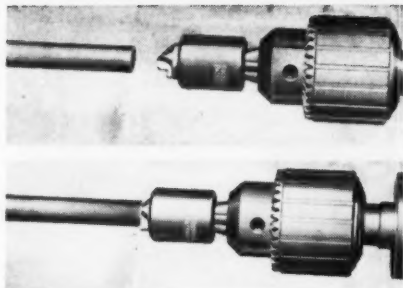
For more data circle 124 on Postpaid Card

★ modern machine shop ★

### **CUTTING TOOL COMBINES THREE OPERATIONS IN ONE**

A new cutting tool, called the TuBurr, combines three operations in one for finishing tube ends in screw machines, multiple spindle machines and tube finishing machines.

Manufactured by Cogsdill Tool Products, Inc., 12976 West Eight Mile Rd., Oak Park 32, Michigan, the TuBurr Tool chamfers both o.d. and i.d. and faces, all in just one stroke.



*The Cogsdill TuBurr Cutting Tool.*

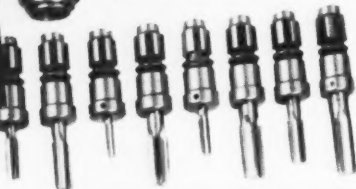
Spindle travel toward the tube automatically centers the cone-shaped TuBurr tip in the tube end, thus eliminating any misalignment. Continued spindle travel retracts the cone into the tool body, exposing the blade for cutting. Upon release of the spindle pressure, the cone returns to its original position, out over the blade.

**Change tools  
in a Split Second**

**Jay-Dee  
UNIVERSAL  
ATTACHMENT**



**NOW, tap to a  
blind bottom  
with no breakage**



A few desirable  
distributorships  
available

NOW YOU CAN perform drilling, reaming, spot facing, and stud driving operations in quick succession, simply by snapping adapters into the versatile Jay-Dee Universal Attachment.

No adjustments are necessary, since the Jay-Dee allows you to tap any size hole within its capacity.

The Jay-Dee CUTS COSTS by eliminating tap breakage — and by speeding up operations.

Literature sent upon request

### **FEDERAL-BRYANT MACHINERY COMPANY**

4639 Washington Boulevard, Chicago 44, Ill., ESTebrook 8-3307

#### **Note these outstanding features**

No vertical pounding  
when bottom hole tap-  
ping

Same tap adapters for  
all metals

Short body lengths  
Virtually no working  
parts to go wrong  
No springs or ball races  
to wear out

No tap breakage  
Split-second tool  
changes  
Pre-determined tap-  
ping torque

For more data circle 533 on Postpaid Card

Blades are interchangeable and available for any angle or degree of chamfer. Capacities range up to 2½ inches i.d. tubing on standard models. Each TuBurr covers a range of tubing sizes by change of blades.

For more data circle 125 on Postpaid Card

★ modern machine shop ★

### COUNTERBORES HAVE REPLACEABLE BLADES

A unique new type counterbore has been developed by The DoAll Co., Des Plaines, Ill. Regardless of size, the blades can be economically replaced. This makes them a "throw-away", even though they easily can be re-sharpened or modified into specials.

Named "Econo-Bore," the blades also are interchangeable so that blades of the same thickness may be used with different shanks and pilots. Due to this feature it is possible to make more than 30 different combinations

of sizes with the Econo-Bore set. The set includes five shafts which serve as both shank and pilot, ten blades and two extra pilots. Screw sizes covered in the set are No. 10, ¼ inch, 5/16, ¾, 1/2, 5/8 and ¾ inch. Pilots and blades are 1/32 inch oversize to allow for clearance. They also may be used for spotfacing.

Econo-Bores are recommended for toolroom or light production work.

## C A M S

Fully equipped modern machine shop with extensive Jig Boring, Surface Grinding, Horizontal Boring and Thread Grinding facilities as well as modern Cam Milling and Cam Grinding equipment.

**Your Inquiries Answered Promptly**

HIMOFF MACHINE CO., INC.

23-16 44th Road

Long Island City 1, N. Y.

For more data circle 535 on Postpaid Card



## TESTS *with* CLOVER LAPPING COMPOUND

Machine lapping is always important—no one uses the process unless it is. And, as makers of the first commercial abrasive compound, Clover knows that the kind of lapping compound you use can make a vast difference in efficiency as well as in finish.

Only testing can prove out the best combination of lap speed, grain, vehicle and pressure. But one thing is sure: you might as well have Clover's 50 years of tests behind you when you start your own.

Check with Clover on lapping and grinding problems. The hardest lapping jobs often respond to an answer that was worked out for something entirely different. Use Clover's experience for a starter—write for suggestions and samples.

## Clover Manufacturing Company

*Norwalk, Connecticut*

Victor 7-4515

*We also make* **CLOVER COATED ABRASIVES**

For more data circle 534 on Postpaid Card



Hand lever operation or  
calibrated feed screw  
Vertical mill available

Price complete as above  
**\$320.00**  
(less motor)



Manufactured by  
**NORTHERN ILLINOIS MACHINISTS**  
Crystal Lake Rd. • McHenry, Ill.

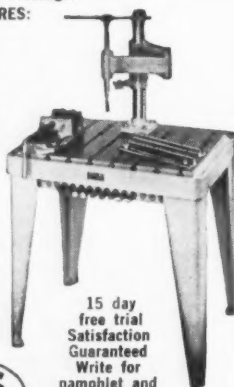
For more data circle 536 on Postpaid Card

## Allman Universal Hand Tapper 5 TIMES FASTER

A great time, labor and material saver. Fixture taps five holes to every one using the free hand method. Eliminates costly tap breakage.

### CHECK THESE FEATURES:

- Articulate arm swings clear of large table for placement of work.
- Limitless number of sizes of tapped holes without moving work piece.
- Vise holds work as small as  $\frac{3}{8}$ " square.
- Floating tap locates itself in hole.
- Individual spindle holds taps, thus change requires only seconds.



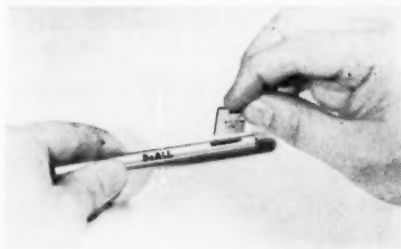
15 day  
free trial  
Satisfaction  
Guaranteed  
Write for  
pamphlet and  
information

**TOOLS,  
INC.**

1734 No. 25th Ave. • Melrose Park, Ill.

For more data circle 537 on Postpaid Card

## new equipment . . .



"Econo-Bore" with replaceable blades.

They are also available individually.  
There are 24 standard blade sizes.  
For more data circle 126 on Postpaid Card

★ modern machine shop ★

## SMALL BORE GAGES INCREASE RANGE

Foster Supplies Co., Dept. MMS, 6122 Milwaukee Ave., Chicago 46, Ill., announces that the Diatest Small Bore Gage Set No. E-O, covering a range of 0.047 to 0.062 inch, has been added to its line. The complete range covered by Sets E-O, E-1, E-2, E-3 and E-4 is 0.047 to 1.130 inches, with all sets overlapping in size to insure complete range.

Also included in the line is the new Set No. E-161 with a range of sizes of  $\frac{1}{16}$  to  $\frac{3}{8}$  inch, in increments of  $\frac{1}{16}$  inch. Special measuring heads are available, designed for checking flush



The Foster Diatest Small Bore Gage.

to the bottom of closed holes. These measuring heads are classified as the EBF Series.

Accurate to 0.00008 inch, Diatest Small Bore Gages check out-of-round, tapers, incomplete bores and all other variations. All parts are obtainable separately.

For more data circle 481 on Postpaid Card

★ modern machine shop ★

### FREE SAMPLE OF LUBRICANT IS OFFERED

A free sample of "EEZ" No. 2-15-T is offered by the manufacturer, Leonard Smith, Inc., 2915 Independence Rd., Cleveland 13, Ohio.

"EEZ" No. 2-15-T (non-toxic) is a success proven metal cutting lubricant used for tapping and threading all types of metals. It is claimed that the use of this lubricant, applied by brush or immersion, will extend tool life, produce smoother finishes and hold close tolerances. It is excellent for blind hole tapping, due to chip removal qualities.

"EEZ" No. 2-15-T is a semi-fluid; it will not dry, harden, skin or deteriorate and is a good rust inhibitor.

For more data circle 127 on Postpaid Card

★ modern machine shop ★

### 102 INCH PRECISION HORIZONTAL ROTARY TABLE

Perhaps one of the largest precision horizontal rotary tables ever built,

a table 102 inches in diameter with a bearing load capacity of 90,000 pounds, has been designed and produced by Machine Products Corp., 6771 East McNichols Rd., Detroit 12, Michigan.

In spite of its size, the new explosion proof table features an accuracy of 5 seconds of an arc, certified by autocollimator reading. Preliminary rotation positioning is achieved by a visible counter, reading from 000 to 359 de-

### The "SECRET" of longer **Punch & Die** life is as simple as 1 - 2 - 3

1. Choose the right tools for the exact work being done.

Our large, planned stocks give a wide choice of style, shape and size—at standard tool prices.

2. Use those tools efficiently.

Charts and instructions are included in our catalog sheets for determining the correct clearance to allow for both type and thickness of metal being punched.

3. Buy high-quality tools made by experienced men.

More than 72 years of experience goes into every Lewthwaite tool—and it shows.

Send for catalog sheets on our complete line of metalworking tools.

**T. H. LEWTHWAITE MACHINE CO., INC.**  
317 East 47th St. New York 17, N. Y.

For more data circle 539 on Postpaid Card

## BOSTON UNIVERSAL ANGLE PLATE

A Precision Tool  
that Holds Work  
at Any Desired  
Angle.



Horizontal motion is 360 degrees; vertical motion, 120 degrees. Fitted with vernier scale reading to 5 minutes.

**Puts Speed and Profit into Angular  
Drilling, Milling, Planing, Shaping, Grinding**

With a Boston Universal Angle Plate on the job, work is quickly set up on the table and but a few seconds are required to locate it at the desired angle. Indispensable in tool rooms and extremely useful in production runs, the Boston Universal pays for itself many times over by eliminating the necessity of expensive jigs and fixtures.

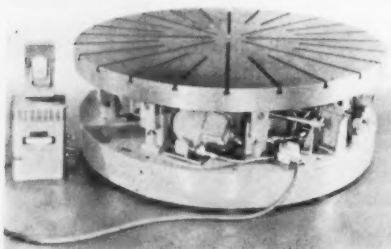
Made in several stock sizes. Write today for full information.

**US AUTOMATIC BOX MACHINERY CO., Inc.**

10 ARBORETUM RD.  
BOSTON 31, MASS.

For more data circle 546 on Postpaid Card

**new equipment . . .**



**102 Inch Precision Horizontal Rotary Table.**

grees. Final position is manual and, with the aid of a microscope, provides minute and second adjustment to permit zeroing in on a precision graduated band and positioning within 5 seconds of arc is easily attainable.

Additional features include: adjusting speed motor drive from zero to 1/3

r.p.m. (108 i.p.m.); high capacity cone worm gearing with positive backlash controls de-energized self-locking brake.

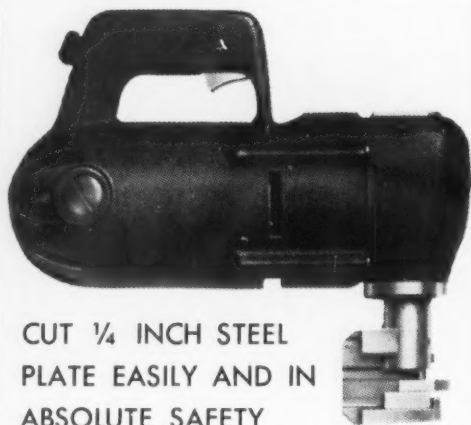
For more data circle 128 on Postpaid Card

★ modern machine shop ★

### **TABLE TYPE PRECISION BORING MILL**

Index Industrial Corp., MM 660 Madison Ave., New York 21, N. Y., announces the redesigned and improved 3½ inch Wotan Table Type Precision Boring Mill, characterized by main spindle being changed from 3¾ to 3½ inches with a boring depth of 31½ inches with larger table and saddle.

The new model embodies high accuracy with optical reading attachments for positioning of spindle head, cross table and outboard. It has a wide range of applications for boring, milling, facing and thread cutting. A special feature is the arrangement of



**CUT ¼ INCH STEEL  
PLATE EASILY AND IN  
ABSOLUTE SAFETY**

WITH THE

**FENWAY  
HEAVY DUTY NIBBLER**

MODEL EHN

The new, lightweight Fenway ¼" Nibbler cuts through ¼" cold or hot rolled steel plus 5/16" aluminum, quickly and easily. Also cuts 8 gauge stainless. Its special design provides absolute safety to the operator and will cut without distortion to material. Clean cutting action reduces need for grinding and buffing edges. Has minimum cutting radius of 8". Weighs app. 20 lbs. **SEND FOR COMPLETE SPECIFICATIONS OR ASK FOR FREE DEMONSTRATION IN YOUR AREA.**

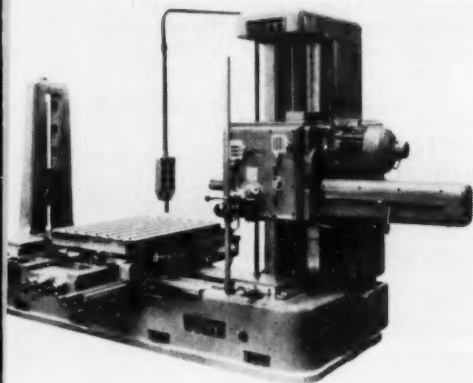
Other Fenway Nibblers are available for a variety of cutting jobs . . . help reduce costs as much as 75%.

**FENWAY MACHINE CO., INC.**

**3107 N. Broad St., Phila. 32, Pa.**

For more data circle 540 on Postpaid Card





Wotan Table Type Precision Boring Mill.

the spindle sleeve with built-in double row ultra high precision cylindrical roller bearings, mounted directly in the spindle head housing.

Facing operations are performed with the facing head mounted on the spindle sleeve. Direction of power feed to head or table is controlled by push-button or separate levers, each of which operates a reversing mechanism. Power operated rotary table is standard equipment and can be operated manually with a crank handle.

Wotan Borers are built with spindle diameters of 3, 3½, 4½ and 5⅞ inches. For more data circle 129 on Postpaid Card

★ modern machine shop ★

### MAGNETIC SEPARATOR

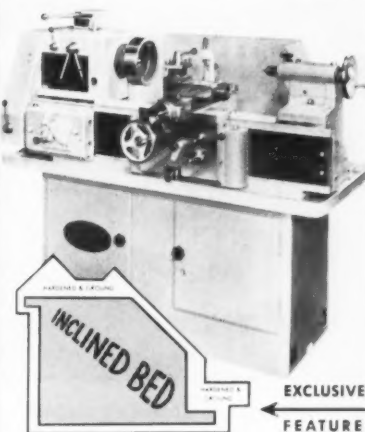
Lincoln Electric Co., Cleveland 17, Ohio, announces a magnetic separator for use with automatic and semi-automatic submerged arc welders. The company states that using the magnetic separator improves welder performance and weld quality by removing from submerged arc welding flux contaminating materials accidentally picked up in handling or use.

The separator, a funnel used to fill the flux container of the automatic

**GAP BED CAPACITY**  
with  
**STRAIGHT BED**  
**RIGIDITY**

**WILSON**

**MARK I 13" LATHE**



### SPECIFICATIONS

Swing Over Bed . . . . . 17 ½"  
Swing Over Cross Slide . . . 8"  
Spindle Bore . . . . . 1 ⅞"  
Drive . . . . . 2 H.P. Motor  
Weight . . . . . 1300 Lbs.

**MARTON EQUIPMENT, INC.**

200 RANTOUL ST. • BEVERLY, MASS.

Some exclusive dealer territories open.

For more data circle 541 on Postpaid Card

MODERN MACHINE SHOP 279

### new equipment . . .

welder, contains three cylindrical alnico magnets. Mill scale, pieces of steel, grindings, spatter and foreign material that were picked up during the previous use of the flux are removed from the flux as it passes across the three magnets.

The magnetic separator is designed for use with mild steel and low alloy

steel fluxes. It is not recommended for use with the higher alloy fluxes, since it would remove some of the alloy. For more data circle 130 on Postpaid Card

★ modern machine shop ★

### TAP FORMS THREADS WITHOUT CHIPS

Jarvis Corp., Tap Subsidiary, North Attleboro, Mass., introduces an entirely new concept in cold forming chipless tapping.

The new tap, Jar-Flo FT (fluted type), forms threads without chips. Prior to this, cold forming taps were fluteless and required more than ordinary torque to drive them. By fluting the new Jar-Flo FT (the flutes do no cutting), contact area has been reduced, thereby lessening drag and reducing driving torque.

Effective lubrication is realized through the fluting, allowing the

### In Checking Surface Roughness



In judging microinch roughness by eye or by "feel," sometimes you'll get the right answer, and sometimes not. *You can never be SURE*; for the "confusion factors" are many, and the brain misinterprets what the senses report — the same as with optical illusions.

That's one reason why industry depends on a confusion-proof *shop instrument*—the PROFILOMETER®—when dependable roughness measurements are required.

**FREE BULLETIN LT1** shows why surfaces that look alike, or feel alike, often differ in roughness by several hundred percent. *Write for it!* You'll be interested, and perhaps surprised.

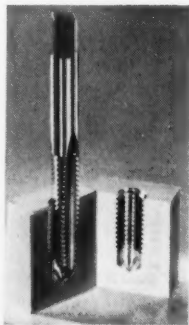


Profilometer is a registered trade-mark.

**MICROMETRICAL  
MANUFACTURING COMPANY**

345 S. MAIN ST., ANN ARBOR 7, MICHIGAN

For more data circle 542 on Postpaid Card



The Jar-Flo FT Tap

lubricant to move directly to forming area. The increased lubrication is said to lengthen tap life, provide smoother threads and allow the same tapping equipment used for standard taps of equivalent size to be employed.

For more data circle 483 on Postpaid Card

★ modern machine shop ★

### 18 TON O.B.I. PRESSES

Kenco Mfg. Co., 5211 Telegraph Rd., Los Angeles 22, Calif., has added

to its line a complete series of 18 ton o.b.i. presses. Standard models in 18 ton capacities include Electro-Safe, Standard, Slow Speed, Variable Speed, Deep Throat. Shut height combinations are offered for a wide range of die requirements and optional accessories feature higher speed with greater safety.

Substantially greater frame strength is achieved by balanced ribbing and controlled cooling of the Sorbitic cast-

*Isn't it nice to  
know that when you buy  
Wilton Vises:*

- 1/ They'll never need oiling!  
(Thanks to Wilton's lifetime lubrication)
- 2/ They're the most rugged!  
(Even have more pounds of malleable iron than most ordinary vises of grey iron)
- 3/ They deliver greatest locking force!  
(Fine machining is the secret)

To get the most vise value for every dollar always specify  
WILTON . . . because the best costs no more!

FOR FREE CATALOG ATTACH THIS AD TO YOUR LETTERHEAD AND MAIL TODAY!



MMS-50

### WILTON MANUFACTURING CO., INC.

9525 IRVING PARK ROAD, SCHILLER PARK, ILLINOIS

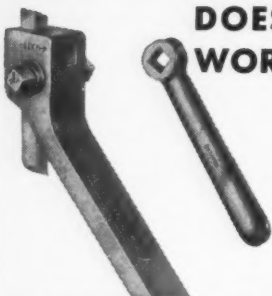
CANADIAN ADDRESS: 178 NORSEMAN ST., TORONTO, ONTARIO

For more data circle 543 on Postpaid Card

**new equipment . . .**

ing, thus removing internal stresses, reducing deflection under load and increasing die life. Crankshafts are one piece, slotless construction for maximum strength and are heat treated alloy, precision ground. Extra long ram guides fully contain the ram at

## ONE TOOL HOLDER DOES THE WORK OF TEN



ONE tool holder for all positions . . .  
No tool chatter . . . can do internal  
boring or internal threading... Ideal  
for carbide tools . . .

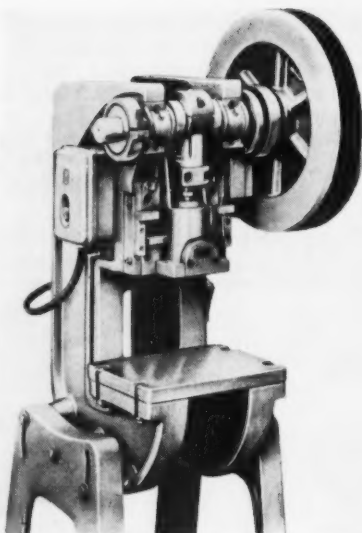
Bit sizes:  $\frac{1}{4}$ ",  $\frac{5}{16}$ ",  $\frac{3}{8}$ ",  $\frac{7}{16}$ ",  $\frac{1}{2}$ ",  $\frac{5}{8}$ "

Furnished with Cobalt Bits

**ACME TOOL CORP.**

73 W. Broadway New York 7, N. Y.

For more data circle 544 on Postpaid Card



Kenco 18 Ton Open Back Inclinable Press.

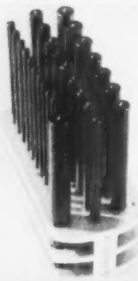
all points in the working stroke for accurate punch closure.

For more data circle 131 on Postpaid Card

★ modern machine shop ★

## COMBINATION PRECOLORED AND OVERSIZED GROUND FLAT STOCK

After considerable research and testing, Marshall Steel Co., Box 108-MM, LaGrange, Ill., has combined the money saving advantages of a new



## SPELLMACO 'SPOTTERS'

**A matched set of transfer punches  
for toolmakers, machinists and tool cribs**

Used for transferring location of threaded, drilled  
and reamed holes, slugs, blanks, etc.

Precision made of finest tool steel—Carefully heat treated and tempered for  
long life—.0025 undersize to facilitate use—Black oxide finish.

SET #3-17; 28 punches with indexed stand—sizes  $\frac{3}{32}$ " to  $\frac{1}{2}$ ", by  
 $\frac{1}{44}$ "—plus handy  $\frac{17}{32}$ " size. Length  $4\frac{7}{8}$ ". ONLY \$19.40.

Single sizes available

**R. L. SPELLMAN CO. • URBANA, OHIO**

For more data circle 545 on Postpaid Card

product, called appropriately "Scribe-It", in precoloring and oversize ground flat tool steel. The precoloring preserves the fine finish and does not increase ground dimensions.

Scribe-It is available in 18 and 36 inch lengths and is easily identified in its new individually aluminum foil wrapper.

This material is priced the same as standard ground flat stock but can be heat treated and then finish ground to nominal size.

For more data circle 132 on Postpaid Card

★ modern machine shop ★

### ABRASION RESISTANT COLD WORK DIE STEEL

Latrobe Steel Co., Latrobe, Pa., announces an abrasion resistant cold work die steel for use in brick mold liners, shot blast liners, ceramic tile liners and for long run blanking and forming dies. Its introduction, the company announced, makes possible a 5 percent reduction in price of its Press-Mor line of products.

Designated as BR-3 Die Steel, this development is said to contain the highest percentages of carbon and vanadium in the cold work die steel field. A typical analysis shows 2.80 carbon, 5.25 chromium and 4.50 vanadium, resulting in hard abrasion resisting vanadium carbides for increased wear.

For more data circle 133 on Postpaid Card

### STRAP WRENCH

Delicate or highly polished materials, cylinders, small hand wheels, knurled knobs and odd shaped parts can be safely turned or adjusted with the newly designed Warnock Strap Wrench, manufactured by Lowell Wrench Co., Dept. M-85, Worcester 8, Massachusetts.

The fabric strap has a soft, yet firm, grip that prevents scratching, denting



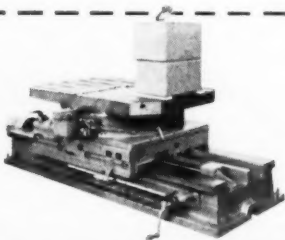
## STANDARD STEEL SPECIALTIES

- **MACHINE KEYS**  
We can supply a complete line of finished machine keys including gib head and taper keys, rod keys, round end keys, etc.
- **WOODRUFF KEYS**  
Complete stock of standard keys on hand for prompt shipment. Made from open hearth or alloy steel.
- **TAPER PINS**  
Available in sizes 7/0 through 10 and lengths from 3/4 inch to 6 inches. Others made to specifications.
- **MACHINE RACK**  
Can furnish rack from almost any size blank and pitch as well as length to form continuous sections.

WRITE FOR CATALOG

**STANDARD STEEL SPECIALTY CO.**  
BEAVER FALLS • PENNSYLVANIA  
Plants: Beaver Falls, Pa.; Hammond, Ind.

For more data circle 547 on Postpaid Card



## new AIRMIST tables index extra-heavy loads

6600-lb. load indexes easily on new 50" x 72" offset AIRMIST table. Range of standard sizes available, 36" and larger; special sizes on request. Any AIRMIST table can be furnished on runways for use with floor type boring mills.

THE CINCINNATI **GILBERT** MACHINE TOOL COMPANY • CINCINNATI 23, OHIO

For more data circle 538 on Postpaid Card

## **new equipment . . .**

or crushing. A new, lightweight handle is shaped to fit comfortably into the operator's hand.

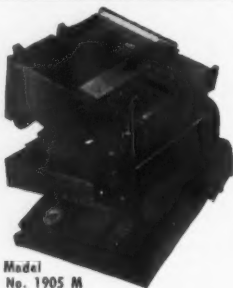
Standard sizes are available with 12, 18 and 24 inch long handles.

For more data circle 134 on Postpaid Card

*Baldy sez...*



When it comes to "checking the angles" you can't beat a **BALD EAGLE Sine Tool**.



Model  
No. 1905 M

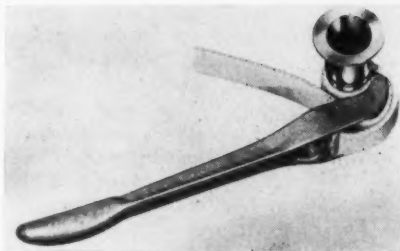
This compound angle sine plate has dual field permanent magnetic chucks that can be magnetized independently, a positive lock on each axis, and a center T slot. Like all **BALD EAGLE Sine Tools**, it's accurate .0002" in dimensions and parallelism. Other models include 5" and 10" Sine Bars and Sine Plates, single and compound, plain and magnetic.



Ask your distributor or write for complete catalog and prices.  
For Quality—Specify Bald Eagle

**BALD EAGLE PRODUCTS CO.**  
356 Cedar St. St. Paul 1B, Minn.

For more data circle 548 on Postpaid Card



View shows the Warnock Strap Wrench.

## **STEEL-CUTTING GRADE OF HARD CARBIDES**

A steel-cutting grade of hard carbides, specifically developed for high speed and high precision machining and for finish machining hard alloys, is announced by Kennametal, Inc., Latrobe, Pennsylvania.

The new cutting tool material, which is known as Grade K165, is available in throw away inserts for all types of Kendex Tooling.

Grade K165 has a titanium carbide base. Its combined edge-wear and crater resistance are said to be considerably greater than those of conventional tungsten carbide cutting tool materials. These properties greatly reduce "loss of size," which is important in precision machining and in finishing cuts.

## ***Air-O-chek***

The Nozzle Valve with the internal fulcrum lever

Available in two models and many sizes

**AIR-WAY**



## **AIR ECONOMY**

SAVE through superior performance, low maintenance, low initial cost. Air-O-chek air guns are of simple design, sturdy construction, and are easy to use.

Write for details

**AIR-WAY PUMP & EQUIPMENT CO.**  
1046 N. Kilbourn Ave., Chicago 51, Ill.

For more data circle 549 on Postpaid Card



The manufacturer states that surface finishes of 12 r.m.s. or better, comparable with ground finishes, can be produced with K165 because of its extreme hardness-strength property.

The characteristics of Kennametal Grade K165 permit machining high temperature alloys that are low in machinability in terms of tool life. When K165 is used, no special tooling or laboratory controls are required in finish machining many alloys, such as stainless steels, tool steels, heat treated alloy steels and hard, non-ferrous alloys.

For more data circle 369 on Postpaid Card

★ m m s ★

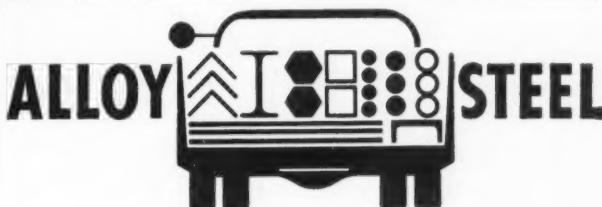
#### 14 STATION MACHINE

A special 14 station machine has been designed by The Lock-former Co., Dept. MD-1, 4615 West Roosevelt Rd., Chicago 50, Ill., for high production of basic parts in the aluminum siding industry. The tool will roll form clashboard aluminum siding at the rate of 60 to 65 f.p.m., normal speed, with other speeds optional. Auxiliary shafts included can be set up with roller dies to run, for example, the

W-section or inside corner used as trim by the industry.

On the inboard side, special rolls on 14 stations fabricate the entire 8 inch aluminum siding panel, prepunching the elongated nailing slots and the weep holes in the bottom section. Approximately 10 $\frac{3}{8}$  inches of 0.032 or 0.025 inch stock material is used. Roller dies are chrome plated to handle the precoated material.

The new machine is equipped with



*whether you require standards, or the best in specials, there's a W-L warehouse near you —*

Wheelock, Lovejoy maintains seven strategically-located warehouses. All of them are completely staffed and completely stocked, to fill your alloy steel needs promptly. Standard AISI and SAE steels, and our own special HY-TEN steels offering advanced metallurgical features at competitive prices, can be had in bars, billets and forgings, in specified sizes, shapes and treatments.

Write today for *free* Wheelock, Lovejoy Data Sheets, containing complete information on grades, applications, physical properties, tests, heat treating, etc.

## WHEELLOCK, LOVEJOY

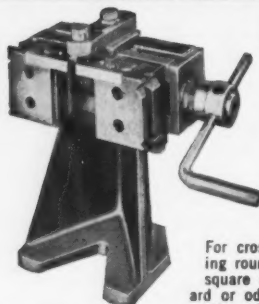
& COMPANY, INC.

140 Sidney Street, Cambridge 39, Mass.



For more data circle 550 on Postpaid Card

## SPEED UP DRILLING & TAPPING JOBS!



### JOHN'S DRILL JIG Self Centering

For cross or end drilling round, hexagon, or square stock or standard or odd-shaped rough castings from 1/4" to 8"

O.D. Will cut tooling and production costs to minimum for 10 to 100,000 pieces. Standard removable slip fit bushings and holders available to drill center or mean off-center. The self-centering action will hold within .0015" or better regardless of jig wear or piece part O.D. variation. Jigs available in three sizes 6", 8", 14"; jaw openings 2", 3 1/4", 7 1/2".

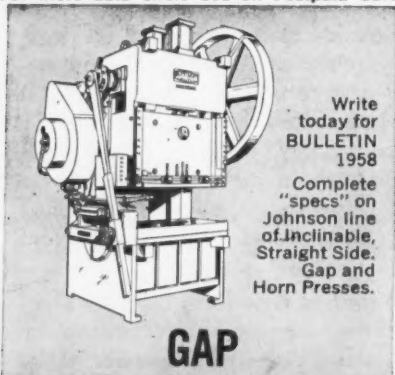
Write for complete information

**HEUSER MANUFACTURING CO.**

1640 N. Paulina St.

Chicago 22, Ill.

For more data circle 551 on Postpaid Card



Write  
today for  
BULLETIN  
1958

Complete  
"specs" on  
Johnson line  
of Inclined,  
Straight Side,  
Gap and  
Horn Presses.

**GAP**

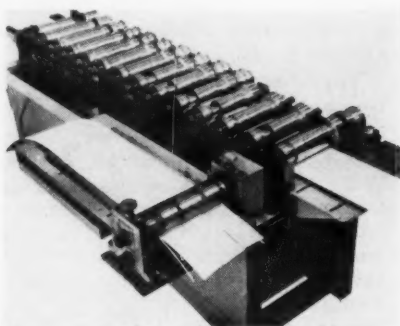
*Johnson*  
**POWER PRESSES**

JOHNSON MACHINE & PRESS CORP.  
620 W. INDIANA AVE., ELKHART, INDIANA

For more data circle 552 on Postpaid Card

286 MODERN MACHINE SHOP

## new equipment . . .



Special 14 Station Lockformer Machine.

heavy duty production type bearings and steel transmission system. Power is from a 7 1/2 h.p., 1,800 r.p.m., 220/440 volt, three phase, 60 cycle motor. For more data circle 135 on Postpaid Card

★ modern machine shop ★

## ADJUSTABLE PRECISION BORING TOOLHOLDERS

M.B.I. Export & Import, Ltd., 475 Grand Concourse, Bronx 51, N. Y., introduces Kaiser, a complete line of adjustable precision boring toolholders, especially designed for jig borers and horizontal boring machines.

The Kaiser Toolholders are known all over the world. They have been in use for many years and are presently

# CAMS

**MADE TO YOUR SPECIFICATIONS**

—Except Screw Machine Cams—

Design Assistance Offered

**KIDDE PRECISION TOOL CORP.**

15 LOCUST AVENUE

ROSELAND, N. J.

For more data circle 586 on Postpaid Card

May, 1960



**Kaiser Precision Boring Toolholder.**

being introduced for the first time on the market of the United States.

Some of the most salient features include—rugged and well balanced design; extremely high cutting capacity; adjustable vernier scale; tool bit advances radially (very important when drilling blind holes); interchangeable shanks.

For more data circle 136 on Postpaid Card

★ modern machine shop ★

### LARGER CAPACITY FOR VERSATILE DUPLEX MILLING MACHINE

W. H. Nichols Company announces a new version of its Twin Mill, which

has a wider, heavier, 36 inch table.

This new model is also provided with 2 h.p. motors for both milling heads to handle heavier cuts over the 20 inch table feed range.

Along with increased cutting capacity and power, the new Twin Mill is equipped with a fail-safe electrical system which automatically returns all the power feeds to their starting positions in the event of power failure.



broken tools  
made like new again  
with **NU-TANGS**™

Twisted or broken tangs replaced at low costs on any tool with a Morse Taper (sizes 1 to 6). Hundreds of leading industries save money on drills, reamers, countersinks, cutters, drivers, the NU-TANG way. Prompt delivery. Send for prices—or send tools for repair. All work guaranteed.

**NO WELDING!**  
**NO SHORTENING!**

*Send them to us like this!*

**NO SLEEVES!**  
**NO DISTORTION!**

*We return them like this!*

**GUARANTEED STRONG AS NEW!**

• Patent No. 2,512,011

**NU-TANGS INC.**

1339 Bates Avenue  
Cincinnati 25, Ohio

For more data circle 587 on Postpaid Card

# THEMAC

## PRECISION TOOL POST GRINDERS

Featuring the circumferentially adjustable spindle assembly—

Mount on any machine tool—In any position—For the precise finishing of any material including ceramics—

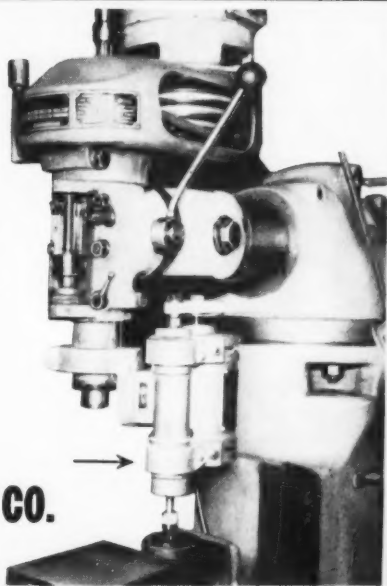
- 14 Models  $\frac{1}{8}$  to 1 H.P.
- Spindle Speeds to 50,000 RPM
- Use Grinding Wheels  $\frac{1}{8}$ " to 6"
- Permanent Lubrication

Write for new catalog

## THE MCGONEGAL MFG. CO.

EAST RUTHERFORD, NEW JERSEY

Telephone GENEVA 8-2313



For more data circle 553 on Postpaid Card

## FOSTORIA LOCALITES

Model 55-BH-701 \$8.60  
each in std. pkg. of 4.



Koolshield:  
\$3 ea. in std.  
pkg. of 4. Fits  
all old and  
new model  
Localite half  
shade reflectors.

cool,  
safe light...  
right where  
you need it!

Universal  
base  
mounts on  
horizontal  
or vertical  
surfaces.

- Ideal lamp for benches, machine tools, assembly lines.
- Instantly adjusts to any desired position.

New, friction-collar-disc joints permit instant positioning... light stays put under severe vibration. Nylon Koolshield snaps over reflector... remains cool to the touch. Universal base, rugged construction, heavy duty socket, Levolver switch.

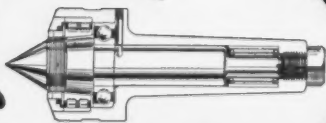
Write for catalog of Localites for every industrial need.

Available through wholesalers everywhere.

**F FOSTORIA CORPORATION**  
FOSTORIA, OHIO

For more data circle 554 on Postpaid Card

## NIELSEN Heavy Duty Live Centers



Adapted for heavy duty work. Precision type ball and roller bearings assure maximum capacity for high speed production and long service.

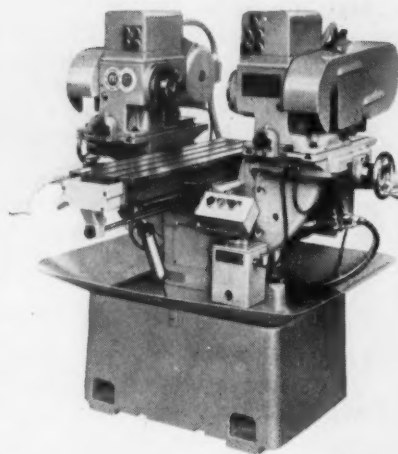
Write for catalog  
M on live centers

**NIELSEN, INC. LAWTON, MICHIGAN**

For more data circle 555 on Postpaid Card

288 MODERN MACHINE SHOP

new equipment...



This Twin Mill features enlarged capacity.

Other Twin Mill features include: independent, six way adjustments by micrometer screws for both milling heads; automatic cutter retraction on table return stroke; provision for double table cycling to allow rough and finish cuts at one setting; pushbutton controlled automatic air-hydraulic variable table feed cycle; automatic lubrication of table ways; complete

## REICH — THE ONLY 3-WAY PRECISION TEST INDICATOR

Accurate and repeated reading in either direction. No mirror needed to read both sides or top. Non rust, non magnetic movement. .014" reading.

Price \$9.00  
Write for folder.



**J. R. REICH MANUFACTURING CO.**  
201 E. Stroop Road Dayton 29, Ohio

For more data circle 588 on Postpaid Card

May, 1960

electrical equipment; and removable splash and chip pan.

The Twin Mill is available from REM Sales, Inc., 5004 Farmington Ave., West Hartford 7, Connecticut. For more data circle 137 on Postpaid Card

★ modern machine shop ★

## FLOW CONTROL VALVES

Rivett, Inc., MMS-3, Brighton 35, Boston, Mass., has introduced a line of 3,000 p.s.i. pressure compensated flow control hydraulic valves, used as ordinary "meter-in," "meter-out" or "bleed off" types. The use of these new valves in a circuit means that excess oil is spilled over a relief valve, thereby permitting the pump to operate always at full horsepower.

Known as the Series 8600, the new Rivett Flow Control Valves contain many advanced engineering features: knife edge orifice positively assures consistently uniform low flow and minimizes change of flow when change of fluid temperature occurs; no drain connection required because special pressure balanced Teflon seals are used; maximum flow capacities up to 125 g.p.m. in 1½ inch size are standard; valves are usable as two and three port models; vernier knob has provision for safety lock wiring; and valves are available with return free-flow check.

Four basic sizes are available, and choice is determined by desired capac-



### DRILL THESE HOLES

BY A QUICK, EASY, INEXPENSIVE METHOD

Your business letterhead will bring literature.

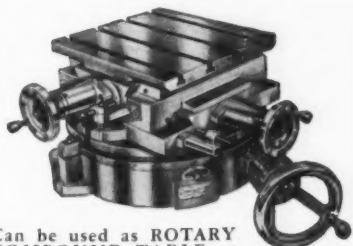
**WATTS BROS. TOOL WORKS**

Wilmerding, Pa.

For more data circle 589 on Postpaid Card

May, 1960

## STEVENS—THREE-IN-ONE ROTARY COMPOUND TABLES IN 3 SIZES



Can be used as ROTARY COMPOUND TABLE or separated to use individually as Compound table alone and Rotary table alone—all on one investment.

The Stevens-Three-in-One will save set-up time and reduce inaccuracies caused by multiple set-ups.

See your dealer or write for bulletins

**The John B. Stevens Company**

Main Street, Somersville, Conn., U. S. A.

For more data circle 556 on Postpaid Card

Another

## VICTOR VALUE

TOP QUALITY — LOWEST PRICES

Our Special Import . . .

### DIAMOND WHEEL DRESSERS

Made of selected, full individual stones, mounted in 7/16" diameter x 6" long cold rolled shank.

Karat	Regular Price	Our New Price
¼	\$ 6.00	\$ 2.85
½	12.00	5.00
¾	21.00	7.50
1	30.00	10.25
1½	54.00	15.00
2	75.00	20.00
2½	102.00	26.00
3	130.00	32.00

These diamonds can be set in any shank to your specifications for \$1.00 each extra.

Order Today—Immediate Shipment from Stock!

**VICTOR MACHINERY EXCHANGE, INC.**

Dealers in Tool Room Equipment

Dept. B, 251 Centre St.

New York 13, N. Y. Tel.: Canal 6-5575

For more data circle 557 on Postpaid Card

MODERN MACHINE SHOP 289

## new equipment . . .

ity:  $\frac{1}{4}$ - $\frac{3}{8}$  inch pipe tap has capacity of 6 g.p.m.;  $\frac{3}{8}$ - $\frac{1}{2}$  inch pipe tap has capacity of 16 g.p.m.;  $\frac{3}{4}$ -1 inch pipe tap has capacity of 30 g.p.m.; and  $1\frac{1}{4}$ - $1\frac{1}{2}$  inch pipe tap has capacity of 125 gallons per minute.

For more data circle 138 on Postpaid Card

"Known as the Best"  
"GEM" VISES—"GEM" AIR VISES



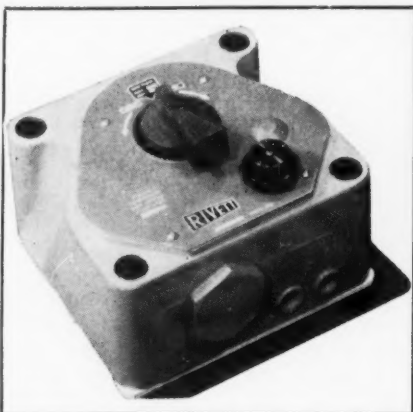
8  
SIZES  
3"  
TO  
12"  
CAP.

PLAIN  
AND  
SWIVEL  
BASE

"QUICK-ACTING", "STURDY", "SAFE", "PRECISION BUILT" for "LONG LIFE", "PRICED LOWER", DEALERS IN ALL PRINCIPAL CITIES.

J. E. MARTIN MACHINE CO.  
Springfield FAIRFAX-23121 Ohio

For more data circle 590 on Postpaid Card



Rivett Series 8600 Flow Control Valve.

## NEW LINE OF GAGES

Instant, accurate readings of internal groove dimensions, permitting

## Accurate Pressure Control on this . . .

# NEW TRI-MATIC Oscillating Belt Grinder

Available in 12", 18", 24" and 30" models, standard and modified for special applications.

. . . provides ONE versatile machine for deburring, descaling, grinding, graining, polishing, color buffing and upgrading.

Controlled Belt Oscillation makes belts cut faster, last longer, finish better and allows use of any belt width, up to maximum, to fit various jobs. Changing belts takes only seconds because pre-set belt tension and belt tracking are automatically controlled.

Unmatched Versatility is the sum of controlled belt oscillation, fast belt changing, variable speed work table conveyor, capacity 0" to 5" with positive adjustment, easily changed contact wheel, wet or dry operation, and rigid head that permits maximum pressure with accurate control.

Ask your TRI-MATIC Distributor or write for Bulletin TM459

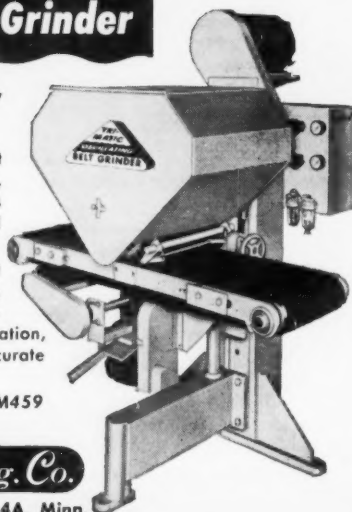
Send your problems to our abrasive engineers for their suggestions. NO OBLIGATION.

## TRI-MATIC DIVISION

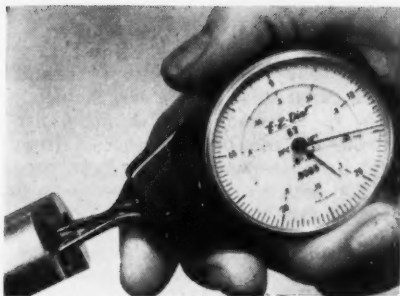
*Sales Service Mfg. Co.*

2361 University Ave., St. Paul 14A, Minn.

For more data circle 558 on Postpaid Card







Maxwell Industries' E-Z Dial Groove Gage.

inspection without removing the work from the machine and without the use of any micrometer, are possible with the economical line of E-Z Dial Groove Gages, introduced by Maxwell Industries, Inc., 493 East Fifth Ave., Ash-tabula, Ohio.

Simple lever action and easy-to-read dial indicator provide a measuring range from 0.2 to 1.6 inches, with the

small dial reading to the nearest hundredth inch and the large dial hand indicating the nearest half-thousandth inch. Each gage has an approximate range of 0.4 inch in the smaller sizes, while the larger sizes have a range of 0.8 inch. Accurate to fractions of 0.0005 inch, it saves time in quality control programs where fast, accurate readings are important. The complete

	<b>STANDARD FIXTURE CLAMPS AND DETAILS</b>
	<b>Save Tool Room Time!</b>
	Precision-machined, hardened, rust-proofed. Fast delivery from stock! Cut design time, increase tool room production and save many man-hours by specifying STANDARD HARCO FIXTURE CLAMPS AND DETAILS.
	Write for free catalog today! <b>HARCO ENGINEERING</b> 12094 Woodbine Avenue Detroit 39, Michigan

For more data circle 560 on Postpaid Card

## Perfect Alignment! Maximum Accuracy!

Your guarantee when you order

### ROOFE HEAVY-DUTY BULL NOSE Centers

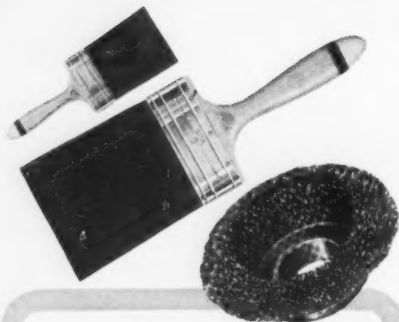
Make sure your next Heavy-Duty Centers are ROOFE "Bull Nose." Two double rows of bearings in the large and small ends of the nose allow perfect positive alignment on any type of work. Two shank sizes provide diameters from  $\frac{1}{2}$ " to  $7\frac{1}{2}$ " for a wide range of work with a single center. Write today for catalog.



## HOUSTON GRINDING & MFG. CO., Inc.

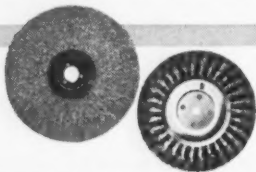
P. O. BOX 7461 • HOUSTON 8, TEXAS

For more data circle 559 on Postpaid Card



**You get more  
satisfactory performance  
and greater economy with...**

## **PITTSBURGH BRUSHING TOOLS**



• **Pittsburgh has been supplying industry** for years with quality brushes designed to meet specific finishing requirements. They're tough enough to resist abrasion. Carefully controlled distribution of brushing stock provides perfect balance and gives top efficiency with economy.

• **Our long experience** in making high-quality brushes for every need can save you time and money. Write or call Pittsburgh Plate Glass Company, Brush Div., Dept. MM-50, 3221 Frederick Avenue, Baltimore 29, Md.



**PITTSBURGH  
BRUSHES**

BRUSHES • PAINTS • GLASS • CHEMICALS • PLASTICS • FIBER GLASS  
**PITTSBURGH PLATE GLASS COMPANY**  
IN CANADA: CANADIAN PITTSBURGH INDUSTRIES LIMITED

For more data circle 561 on Postpaid Card

292 MODERN MACHINE SHOP

## **new equipment . . .**

line of four E-Z Dial Groove Gages has a range of location depths from 15/16 to 2 3/8 inches. The gages are capable of measuring grooves from 0.080 inch deep on the smallest gage to 0.350 inch on the largest.

For more data circle 139 on Postpaid Card

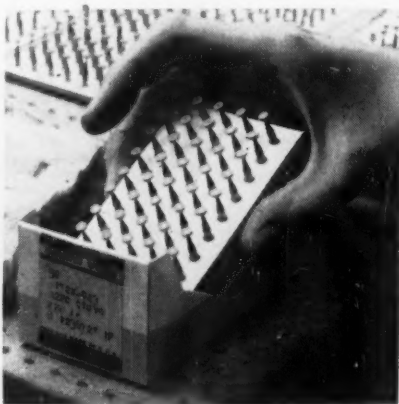
★ modern machine shop ★

## **MINIATURE PRECISION MOUNTED GRINDING WHEELS**

A new line of miniature precision mounted grinding wheels, known as "Minigrind" Mounted Wheels, has been developed by Norton Co., Worcester 6, Massachusetts.

These abrasive wheels, made as small as 0.036 inch in diameter and as thin as 0.016 inch, were developed for use in miniature precision bearing manufacture. Additional applications for these miniature wheels are being found in the tool and die industry, specifically on jig grinders.

These tiny mounted wheels are so thin that the wall thickness is only the width of a few abrasive grains. Special mixing procedures had to be



Norton "Minigrind" Mounted Wheels.

May, 1960

developed to insure uniform and thorough coating of bond on each abrasive grain in the fine grit mixes used.

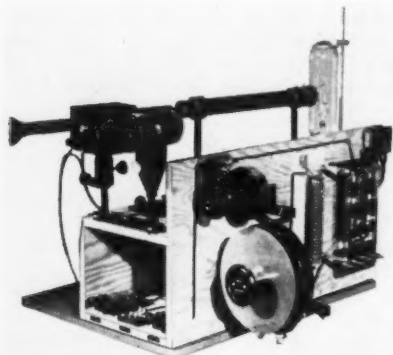
For more data circle 140 on Postpaid Card

★ modern machine shop ★

### **OPTICAL PYROMETER CALIBRATING SET**

The ever-increasing use of Optical Pyrometers and demands for accuracy in high temperature measurements has sharply focused the need for a precision type test set with which to calibrate these instruments. Pyrometer Instrument Co., Inc., Bergenfield 42, N. J., announces that its Pyro Model No. 107 Optical Pyrometer Calibrating Set has been designed as a versatile and precise unit which will permit the accurate and simultaneous calibration of any two optical pyrometers, irrespective of manufacture.

It is furnished as a totally packaged set, ready to use and complete with a Certificate of Calibration, obtained from equipment calibrated at the National Bureau of Standards. A wide filament strip type lamp can be adjusted by step and vernier rheostats to any desired temperature in the range from 1,400 to 4,200 degrees F. (800 to 2,300 degrees C.). Suitable instrument holders and brackets are furnished to



*Pyro Optical Pyrometer Calibrating Set.*

May, 1960

# *Spartan*

## **SAF-T HOLE SAWS**

**HIGH SPEED**

**WELDED EDGE**

**SHATTERPROOF**



For those tough jobs where safe, fast cutting is required, these Saf-T Hole Saws will cut clean, round holes, from 9/16" through 6" diameter, in many varieties of steel, brass, bronze, aluminum, plastics, wood, cast iron, pipe, sheet steel, etc. Made with interchangeable arbors. High Speed Pilot Drill furnished. Ideal for Portable Power tools, Lathes, and Drills.

***There's a SPARTAN  
Distributor near you  
ready to serve***

***Write for Hole Saw Bulletin 16***

**SPARTAN SAW WORKS, INC.  
SPRINGFIELD, MASS.**

For more data circle 562 on Postpaid Card

MODERN MACHINE SHOP 293

**WOODRUFF KEYSEAT CUTTERS  
SHARPENED  
Shank Type**

**50¢  
EACH**

Any Size, Any Quantity, Any Condition.  
Resharpener with Standard or Special  
Cutting Clearance Angle. Also, reground  
to Special widths. Ship to:

**SUPREME KEYSEAT CUTTERS CO.**  
1328 Forty-third St. OL 4-8800 Kenosha, Wis.

For more data circle 563 on Postpaid Card



Unconditionally  
Guaranteed!

**NEW  
INSTA  
HOLD-DOWN  
CLAMPS  
"CLAMPS WITHOUT  
SHIMS"**

Holds work securely on:  
Jig Bore • Planners  
Punch Presses • Drill  
Presses • Mills • etc.  
Write for Bulletin 47-A

2420 Home Place

Dearborn 8, Michigan

For more data circle 564 on Postpaid Card

**GUARANTEED to cut costs  
PIN-MOUNT CORE DRILL**

**ALL NEW TWO-  
PIECE CORE DRILL**

**DESIGNED FOR**

Accurate Flute

Alignment

Greater Flute

Depth

Faster Chip

Removal

Economy

Standards from 3/4" dia-  
meter in stock. Specials  
and carbide tipped cut-  
ters to order.

Write for Illustrated Bulletin

**METCUT**

INDUSTRY'S FINEST END CUTTING TOOLS

**METAL CUTTING TOOLS INC., Rockford, Illinois**

For more data circle 565 on Postpaid Card



**new equipment . . .**

permit the mounting of different types  
of optical pyrometers.

The Test Set eliminates uncertain-  
ties and provides an accurate and easy  
method for calibrating all types of  
optical pyrometers in the field.

For more data circle 141 on Postpaid Card

★ modern machine shop ★

**COOLANT FOR BROACHING  
AND RIFLING**

A new coolant, said to be a "work  
horse" cutting oil, formulated to pro-  
vide the necessary cooling and load  
carrying properties to handle the  
toughest cutting problems, has been  
developed by Michigan Tool Co.,  
Shear-Speed Chemical Products Div.,  
7125 East McNichols Rd., Detroit 12,  
Mich. Known as Shear-Speed H-109,  
it provides excellent chip-load distri-  
bution through its maximum chemical  
activity. It does an outstanding job  
in machining improved finishes, under  
E.P. conditions, on internal horizontal  
broaching and rifling operations on  
soft, tough or stringy metals.

The efficient cooling and lubricating  
properties provided by this clean,  
pleasant smelling, non-irritating oil  
help increase operator efficiency. In  
addition, H-109 contains no irritating  
additives — operators are protected  
against skin irritations.

For more data circle 142 on Postpaid Card

★ modern machine shop ★

**COMPACT, PNEUMATIC NIBBLER**

Modern Mfg. Co., Inc., 680 Davis-  
ville Rd., Willow Grove, Pa., intro-  
duces a compact, pneumatic nibbler  
for cutting sheet metal up to 13 gauge  
stainless steel without distorting or  
curling.

The company claims that this light-  
weight, air powered nibbler was de-  
signed for safety and efficiency in



The Modern Compact Pneumatic Nibbler.

cutting heavier metal than other nibblers of comparable size and weight.

This new model is an addition to others, being marketed by Modern, which cut sheet metal, wire and corrugated products.

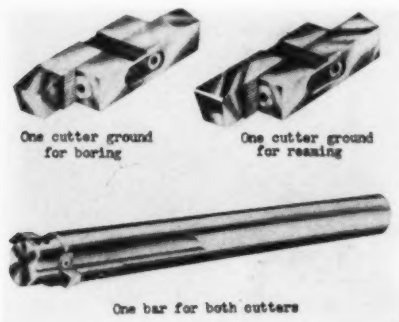
For more data circle 143 on Postpaid Card

★ modern machine shop ★

### SHORT RUN TOOL KIT

A Short Run Tool Kit, permitting unusual savings in time and tool inventory for limited boring and reaming operations, is announced by Muskegon Tool Industries, Inc., Eleventh at Western, Muskegon, Michigan.

The kit utilizes one bar and two adjustable cutters for a given boring and reaming operation. One cutter is ground for boring and can be replaced by the second cutter, which is ground for reaming, without disturbing the bar setup. Since the cutters are fully ad-



View of Muskegon Short Run Tool Kit.

May, 1960

## Angle Tangent to Radius WHEEL DRESSING *Simplified*

WITH  
**ROTHFUSS TOOLS**



### THE G-5 RADIUS DRESSER

is a precision engineered tool that will dress either a convex or a concave radius from .015" to 1.750" on all wheels up to 10" and it may be set to the exact radii desired. Graduated stops allow you to dress any desired portion of a radius. The spring tension journal insures chatter free operation.

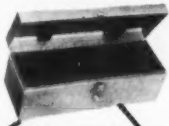
Price \$80.50

### THE G-2 ANGLE DRESSER AND TOOL HOLDER



Price \$87.50

is actually two tools in one, having an easy to read vernier scale 0° to 180° giving accuracy within 2" of 1°; an excellent time saver to set up jobs to be milled, drilled, tapped on any desired angle.



All for only  
**\$149.50**

(including case and both tools with diamonds)

### FREE STORAGE CASE

of light-weight steel, with a hinged top, heavy duty latch and a blocked interior to insure the safety of the dressers when carried.

### OUR FIXTURES

will dress most radii and angles tangent each other, similar to those shown below.

Distributorship available in select territories

**ROTHFUSS TOOL**  
COMPANY

BOX 2693, ELMWOOD STATION PROVIDENCE 7 R. I.  
For more data circle 566 on Postpaid Card

MODERN MACHINE SHOP 295

70,000 R.P.M.

TURBINE  
AIR

GRINDER

**GUARANTEED  
FULL YEAR**

**\$4950**

complete  
including  
accessories



Perfect for intricate  
tool and die work

**NEWAGE INDUSTRIES, INC.**

222 York Road

Jenkintown 19, Pa.

For more data circle 567 on Postpaid Card

### TAP BUSHINGS

Drives all standard taps  
from No. 0 to 1½" and  
pipe taps from ½" to 1".  
Five o.d. sizes.



LESS TAP BREAKAGE

LESS TAP WEAR

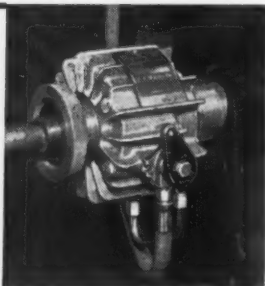
Write for Bulletin

**BYCO INDUSTRIES**

2200 SNELLING AVE., MINNEAPOLIS, MINN.

For more data circle 568 on Postpaid Card

**WILSON  
AIR  
COLLET  
CLOSER**



### STEP UP PRODUCTION 20% +

... for most lathes to 1"  
bar stock capacity

- Hold delicate parts without damage or adjustment
- Iron grip for heavy work
- No adjusting for stock or part variations
- Finger-tip or foot control eliminates operator fatigue
- Eliminates jarring of head stock

(Ten day FREE TRIAL to reliable firms)

**WILSON AIR COLLET CLOSER, INC.**

909 40th Ave. NE, Minneapolis 21, Minn.

For more data circle 569 on Postpaid Card

296 MODERN MACHINE SHOP

### new equipment . . .

justable, the user can machine a wide range of diameters with minimum tool inventory, as well as much less setup time.

For holes ⅝ to 1 inch in diameter, the Short Run Tool Kit provides one standard slot bar and two standard cutters, one ground for boring and one for reaming. For holes 1 inch and larger, one heavy duty slot bar and two heavy duty cutters are provided.

The kit is expected to be of primary interest wherever boring and reaming operations are infrequent or restricted to short runs.

For more data circle 144 on Postpaid Card

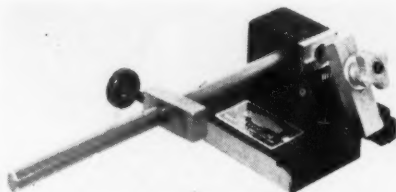
★ modern machine shop ★

### JIG DESIGNED FOR CUTTING EJECTOR PINS TO LENGTH

Monarch Mold and Engineering Corp., 2321 North 28th St., Milwaukee 10, Wis., has announced the availability of a handy jig, designed for cutting ejector pins to length. It will handle all diameters from 3/32 to ¾ inch—any length.

Other features include: hard steel inserts, all wearing parts are hardened, black wrinkle finish, sturdy cast body, ground edges for aligning and this Monarch Ejector Jig is fast, convenient and accurate.

For more data circle 145 on Postpaid Card



Monarch Ejector Jig for moldmakers.

May, 1960



## "SIT DOWN" TYPE WET BLAST UNIT

A new wet blast unit, capable of operation from a "sitting down" position, is announced by Pressure Blast Mfg. Co., Inc., 75 Pleasant St., Manchester, Conn. This Consol-Matic was specially designed for the high production rate finishing of small parts such as eyeglass frames, cuff links, spark-plugs and vacuum tube leads, operations normally handled by women.

Two bays are provided at the operating station where work is loaded and unloaded. Moving blast guns, driven by air cylinders, are positioned at each bay. In operation, the operator places parts in either or both bays and depresses the foot lever. This begins movement and activation of the blast guns. A preset timer determines the length of blast time, as well as the speed of gun oscillation.

The design of the bays or parts allows for the use of masks, if decorative effects are to be achieved, such as in the case of eyeglass frames. Positioning devices are provided for the



The "Consol-Matic" Wet Blast Unit.

May, 1960

## 4 Reasons why you should use

### GAMMONS DIE REAMERS



Specially treated for  
today's modern die  
steels.



Rapid cutting capacity.



Tapers per inch .005,  
—.008,—.013 in stock.



Large range of stand-  
ard sizes in stock at all  
times for your conveni-  
ence.

WRITE FOR  
COMPLETE INFORMATION

**GAMMONS • HOAGLUND CO.**

MANCHESTER 7, CONN.  
Manufacturers of helical taper pins, chucking,  
die makers and special reamers.

For more data circle 570 on Postpaid Card  
MODERN MACHINE SHOP 297

"Jorgensen"  
and  
"Pony"

## CLAMPS




**ASK YOUR  
SUPPLIER.**  
Send for free  
32-page  
catalog.

the clamp folks


**ADJUSTABLE CLAMP CO.**  
436 N. Ashland, Chicago 22, Ill.

For more data circle 571 on Postpaid Card

## BREMIL

The IMPROVED Compound Lever Shears

**ALL ALLOY  
FULLY  
GUARANTEED**



**Two Sizes**

**PORTABLE**

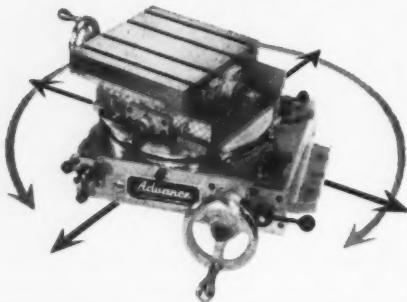
No. 1 cuts up to No. 11 gauge strip or sheet.  
No. 2 cuts up to 1/4" steel plate.

**BREMIL MFG. CO.**  
1020 Holland St., Erie, Pa.

For more data circle 572 on Postpaid Card

## Advance.

### CROSS SLIDE ROTARY TABLE



**FAST, PRECISE** milling of dies and molds by eliminating conventional rotary table "set-ups". Hundreds in die, mold, and tool shops.

**ADVANCE PRODUCTS CORP.**  
BENTON HARBOR, MICHIGAN

For more data circle 573 on Postpaid Card

298 MODERN MACHINE SHOP

### new equipment . . .

blast finishing of parts such as spark-plugs or vacuum tube leads. Guns are individually movable, which adds to the flexibility of the unit.

The Consol-Matic operates on the aspiration system, which eliminates the need for a pumping mechanism in the blast circuit. Employing fine abrasives (up to 5,000 mesh), the unit imparts fine, satin, chemically clean surfaces without heavy etching, stock removal or distortion.

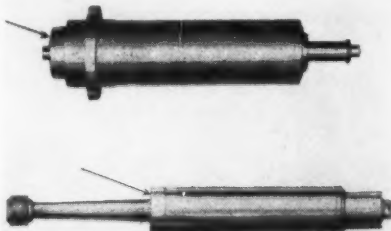
Dimensions of the Consol-Matic are 46 inches high, 24 wide and 34 deep. Construction is of 14 gauge stainless steel. Weight is only 130 pounds, which allows installation on upper floors of buildings where stress is a factor.

For more data circle 146 on Postpaid Card

★ modern machine shop ★

### SPINDLES HAVE CONCEALED AXIAL AIR FLOW COOLANT REPELLING FLINGER

Pope Machinery Co., 261 River St., Haverhill, Mass., announces the development of an improved, concealed, axial air flow flinger that is proving successful in preventing coolant from entering the spindle bearings and that provides complete protection for the operator from the hazard of exposed high speed rotating end covers.



New concealed flinger in Pope Spindles.

May, 1960

The new flinger is now incorporated in Pope Internal Grinding Spindles. These precision spindles are built so that the total eccentricity of the shaft, measuring in the tapered hole, will not exceed 0.000020. They are dynamically balanced with all rotating parts in full assembly to 0.000025 amplitude of vibration.

For more data circle 147 on Postpaid Card

★ modern machine shop ★

## HYDRAULIC PRESSES

American Steel Foundries, Elmes Engineering Div., 1170 Tennessee Ave., Cincinnati 29, Ohio, is marketing the Hydrolair line of presses. Hydrolair is the Elmes trademark of a special type of low cost hydraulic press made specifically to meet the needs of small press users.

All Hydrolairs have these advantages: hydraulic operation plus low cost air power, instant build-up to

continuously maintained high pressure stroke, full tonnage held with no power consumption, just a few controls — ready-at-hand, easy to install and move, simple construction—low maintenance cost, furnished as complete package units, ideal for many uses, such as laboratory research work, compacting, rubber molding, laminating, assembly, gluing and plastics molding (within range of pressing speed).

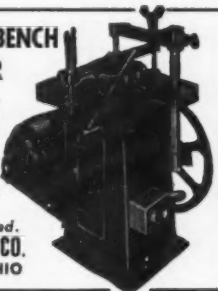
## READING BENCH KEYSEATER

Portable — move directly to job; a time saver for both small and large shops.

3 3/4" stroke; adaptable for other work.

Low first cost — prompt delivery.

Good dealers wanted.  
**READING MACHINE CO.**  
CINCINNATI 37, OHIO



For more data circle 591 on Postpaid Card



**MONEY-BACK TRIAL OFFER**  
Order a trial gallon of each today for testing in your shop. We'll cancel the bill if you're not satisfied.

**PREVENTS HEAT TREAT SCALE . . .**  
up to 1500°F. Brush on, heat, brush off. All metals.

## cut weld cleaning time by 85%

Throw away your cold chisel and whisk off weld spatter with a dry rag! Protect-O-Metal spatter-proofing compounds make weld cleaning a breeze. Improve your welds at the same time . . . P-O-M compounds quiet the arc, improve fusion and electrode operation, prevent oxidation and annealing scale, cause no porosity. No smoke odors, or fumes.

**P-O-M No. 2.** Non-inflammable, non-toxic water-soluble paste. Inorganic. Thin before applying and start welding at once. \$3.40 per gallon, f.o.b. Dayton.

**P-O-M No. 8.** Rust- and corrosion-resistant resin base compound. Comes ready to use. Safe for all metals. Good paint primer; permits outdoor storage of subassemblies. \$3.45 per gallon, f.o.b. Dayton.

## PROTECT-O-METAL

G. W. SMITH & SONS, INC.

1702 SPAULDING RD., DAYTON 3, OHIO

For more data circle 574 on Postpaid Card

Accurate Hole Transfer Made Easy With

### NIELSEN TRANSFER SCREWS

Simply insert in holes, invert, strike sharply and you have centers and drill circles perfectly located. Reduce time and eliminate spoilage of other methods. 8 sizes, from  $\frac{3}{16}$ " to  $\frac{3}{4}$ " U.S.S. Inexpensive — Last for years.



Write for Circular  
**NIELSEN TOOL &  
DIE COMPANY**  
17336 Lahser Road  
Near Grand River  
Detroit 19, Michigan

For more data circle 575 on Postpaid Card

- **PIERCING PUNCHES**
- **BUTTON DIES**
- **STANDARDS • SPECIALS**

Also send Blue Prints for Estimates on screw machine products and centerless grinding.

**PEMCO PERFORATORS CO.**  
DIVISION  
**PORTER MACHINE CO.**  
CINCINNATI 9 OHIO  
30 YRS. SERVING INDUSTRY

For more data circle 576 on Postpaid Card

## NEW FLYNN

"60"

SERIES

OFFSET

**BORING HEADS**

This new precision offset boring head is designed for  $\frac{1}{2}$ " to 1" bar capacity. Features long, stocky tool block for securing the tool. Vernier simplifies close visual adjustment.

**INTERCHANGEABLE ARBORS AND SHANKS  
SAFETY ROUND CONTOURS**

Complete Line of Boring Heads and Tools

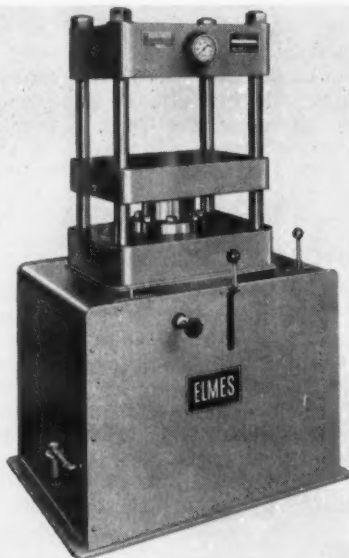
**WRITE FOR CATALOG**

**FLYNN MANUFACTURING CO.**  
18301 WEAVER, DETROIT, MICHIGAN

For more data circle 577 on Postpaid Card



new equipment . . .



The Elmes Air Powered Hydraulic Press.

While powered solely by economical compressed air, the Hydrolair itself is a 100 percent hydraulic press, with all of the advantages of hydraulic pressure application. Developed specifically for small press users, the presses are highly compact in design, occupying a relatively small floor area; however, they are built throughout to big press quality standards.

For more data circle 148 on Postpaid Card

★ modern machine shop ★

### HYDRAULIC EXPANDING MACHINES

Greenerd Arbor Press Co., 41 Crown St., Nashua, N. H., announces the E-62 and E-93 Hydraulic Expanding Machines.

The E-62 has a maximum pull of the ram of 62 tons; the E-93, 93 tons.

Component parts of the main machine are cast of hard Meehanite metal. Cylinder is bored and honed to size; equipped with steel piston and cast iron piston rings. The hydraulic power unit is mounted on an oil sump and is a separate unit mounted behind the machine and is connected with flexible, high pressure tubing.

Greenerd claims that its hydraulic expanding machines have proven their value in sizing or stretching sheet metal cylinders, cones or bands to the close limits of size as required for resistance or fusion welding of parts.

The pie shaped segments, that mate with the master segments furnished with the machine, are inexpensive and permit the use of the equipment to its fullest advantage on experimental and short production runs, as well as high production runs. Ring fits can be easily obtained between sheet metal parts



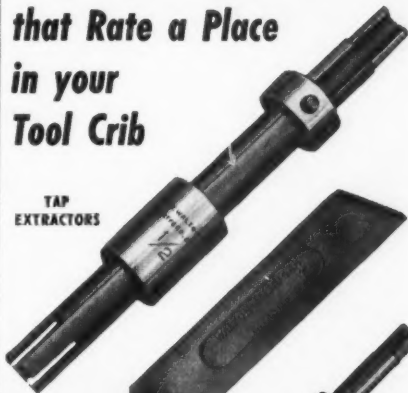
*Greenerd Hydraulic Expanding Machine.*

May, 1960

## Specialized TOOLS

*that Rate a Place  
in your  
Tool Crib*

TAP  
EXTRACTORS



TAP  
EXTENSIONS  
(2 styles)

"Multi-Position"  
TOOL  
HOLDERS



PIPE, STUD  
AND SCREW  
EXTRACTORS

The cost of Walton Specialized Tools is negligible compared with the labor and time cost that they save. A Walton Tool readily at hand is insurance against lost time. Try them at our expense in your shop . . . and rate them for a place in your tool crib.

Write for Data

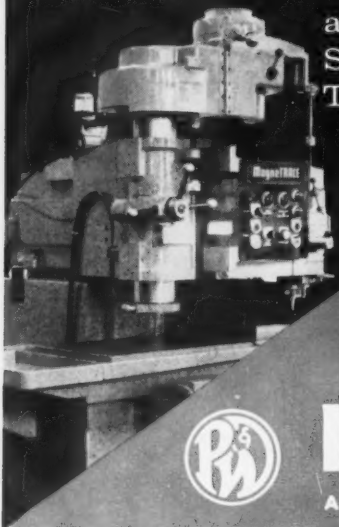
Folder No. 10



For more data circle 578 on Postpaid Card  
MODERN MACHINE SHOP 301

## MACHINE COMPLEX CONTOURS

at Plain Milling  
Speeds, Feeds and  
Tolerances!



The Magne-TRACE is designed specifically for 360° profile milling under tracer control. Has powerful spindle drive and follows template at constant pre-set feeds up to 80" per min. Many jobs usually requiring roughing and finishing cuts are completed in a single pass. Finer finishes and much longer cutter life are obtained. Extremely sensitive tracer and elimination of backlash in drives permit profile milling with plain milling accuracy. Write Pratt & Whitney, West Hartford, Conn., today for complete information.



**MagneTRACE**  
AUTOMATIC PROFILER

For more data circle 579 on Postpaid Card

### new equipment . . .

and line to line fits between sheet metal cylinders and solid flange rings. Variations in size are eliminated in the stretching, so that pieces hold accurate diameters for fitting or mating (brazing fits, welding and so on).

Both the standard E-62 and E-93 Machines have 30 inch diameter tables. They are equipped with 12 segment master jaws, 6 inches high; minimum diameter, 7.572 inches; true diameter, 9 inches; maximum diameter, 9.158 inches. The machine is capable of producing six cycles per minute. Expansion is controlled by an adjustment on top of the cone.

The standard machine is operated by means of a manually operated hand control or it may be furnished with electric pushbutton control and time lag of the ram. These two machines are

accurate and well designed, and they may be furnished for stretch-forming metal cold or water cooled for work with material in high temperatures. For more data circle 149 on Postpaid Card

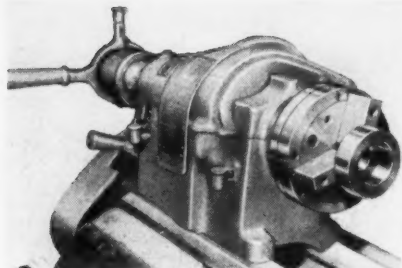
★ modern machine shop ★

### 5 INCH PRECISION CHUCK

The Model 1000 5 Inch Precision Chuck, for use on high speed precision lathes, boring machines and grinders, is announced by PowerGrip, Inc., Rockfall, Connecticut.

This precision chuck is supplied with blank top jaws, which are designed to be bored out to fit the workpiece. It is accurate to less than 0.0005 inch. It will hold work up to 3½ inches in diameter on the o. d. or i. d. The chuck has a ¾ inch hole through it, which permits coolant to be piped through the spindle. The chuck can be operated either by an air cylinder or





5-Inch PowerGrip 1000 Precision Chuck.

by a lever type collet closer. The operator can change over from the chuck to collets in a few minutes.

The face of the chuck extends only  $1\frac{3}{8}$  inches beyond the end of the spindle. The chuck weighs only  $8\frac{1}{2}$  pounds. The light weight and short spindle overhang reduce the possibility of vibration and chatter.

For more data circle 150 on Postpaid Card

## HAMMER-STYLE HOLDER

The Pannier Corp., 202 Sandusky St., Pittsburgh 12, Pa., announces a hammer-style holder for marking with steel character dies.

The new feature of the holder, known as "Flexaligner", is its self-alignment, permitting the stamping of clear markings by compensating for slope or other irregularity of the marking surface, for tilted holder positioning and for glancing of the striking hammer.

When the holder is tilted, the pivoted anvil seeks its own alignment and maintains contact with the steel stamping type, thus transmitting full striking force imparted by the hammer. The anvil is properly heat treated for long life and is replaceable, extending the useful life of the holder itself.

The holder also features the Roto-Lok, which is rotated 180 degrees to



## MILLING CUTTERS

*A Complete Line of the  
Highest Quality*

Whatever your needs, you can get the right standard or special milling cutters to do the job better from one convenient source . . . Pratt & Whitney. Like all other P&W Cutting Tools, you can be sure they'll cost you less in the long run . . . because they run longer! Write now for complete information. Pratt & Whitney Company, Inc., 25 Charter Oak Boulevard, West Hartford, Conn.

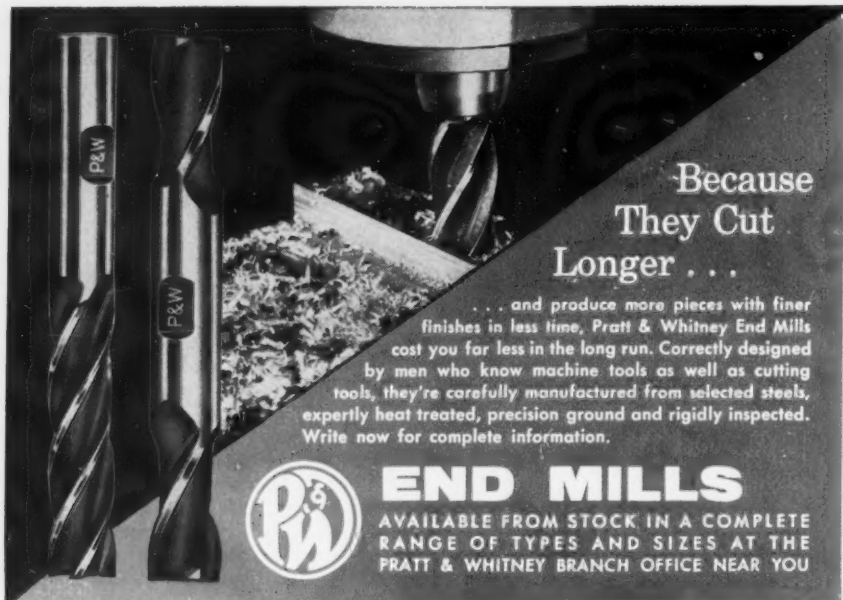
AVAILABLE FROM  
STOCK AT THE P&W BRANCH OFFICE NEAR YOU



## PRATT & WHITNEY

FIRST CHOICE FOR ACCURACY  
MACHINE TOOLS • GAGES • CUTTING TOOLS

For more data circle 580 on Postpaid Card



**Because  
They Cut  
Longer . . .**

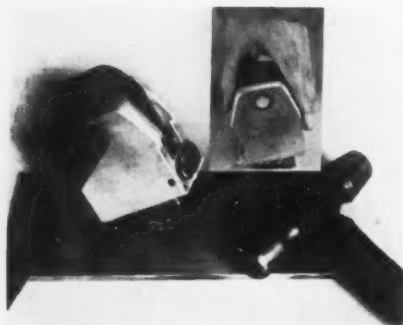
. . . and produce more pieces with finer finishes in less time, Pratt & Whitney End Mills cost you far less in the long run. Correctly designed by men who know machine tools as well as cutting tools, they're carefully manufactured from selected steels, expertly heat treated, precision ground and rigidly inspected. Write now for complete information.

**END MILLS**

AVAILABLE FROM STOCK IN A COMPLETE RANGE OF TYPES AND SIZES AT THE PRATT & WHITNEY BRANCH OFFICE NEAR YOU

For more data circle 581 on Postpaid Card

**new equipment . . .**



**"Flexaligner" Hammer Style Holder.**

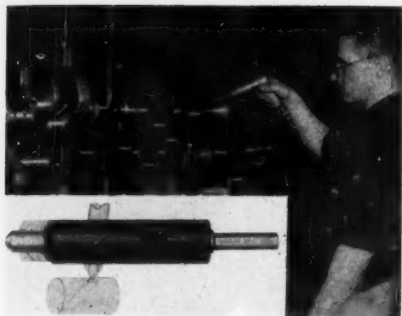
quickly lock in place, or release for changing, the number or letter dies. The holder is provided with a rubber-gripped steel handle.

For more data circle 151 on Postpaid Card

### **DEBURRING AND CHAMFERING TOOL FOR ANGULARLY DRILLED HOLES**

Deburring and chamfering of the angularly drilled holes in automotive crankshafts can be easily accomplished with the "Ellipti-Bur," a unique deburring tool developed by Nobur Mfg. Co., 6860 Farmdale Ave., North Hollywood, Calif. The Ellipti-Bur, developed especially for all applications involving irregular hole surfaces like those obtained by drilling into a cylindrical surface, or an angular plane, automatically follows the hole configuration and produces a chamfer of relative uniformity and symmetry.

With the Ellipti-Bur, operation is extremely fast, requiring neither jigs, fixtures nor skilled operators. A conical pilot is easily directed in the hole using a low speed, portable air drill motor. The deburring operation may be performed as parts progress along



**Ellipti-Bur Deburring and Chamfering Tool.**

a conveyor line or while palletized between successive machine stations. The cutter does not come in contact with the workpiece until the pilot is properly seated, thus preventing misapplication or surface injury to the workpiece. Once the pilot is seated, the two lipped cutter is independently free to follow a consistently changing

surface pattern. Despite the irregular hole geometry, the tool is said to function smoothly, without "kick," "bounce" or handling difficulty because the specially designed cutter "floats" in the central tool body and no motion is transferred up to the operator's hand.

For more data circle 152 on Postpaid Card

★ modern machine shop ★

### **PRECISION BORING QUILLS ALLOW INFINITE SIZE CONTROL**

Precision boring quills that allow infinite adjustments in controlling the size of holes without loosening or tightening screws are announced by Briney Mfg. Co., 1165 Seba Rd., Pontiac, Mich. The quills also permit incorporating an integrally operated depth control adjustment, when required. With this new design, the user can "split tenths" (adjust smaller than

## **Check Class 3 and 3A Threads ...DEPENDABLY, ECONOMICALLY**

The P&W Tri-Roll Thread Comparator, using full-length rolls, provides a *complete functional check* . . . detects errors in lead, angle, pitch diameter and in deviation from true helical path ("drunken lead"). With interchangeable single-rib rolls, the same comparator provides a *critical check* of pitch diameter . . . duplicating, for the first time in a production gage, the highly precise 3-wire measurement method. Write for complete information, Pratt & Whitney Company, Incorporated, 25 Charter Oak Blvd., West Hartford, Conn.



FUNCTIONAL CHECK

CRITICAL CHECK OF P. D.



# **PRATT & WHITNEY**

FIRST CHOICE FOR ACCURACY

MACHINE TOOLS • GAGES • CUTTING TOOLS

For more data circle 582 on Postpaid Card

**Z-I-P!**  
IT'S OPEN IN A JIFFY!



**JIFFY PADDED  
SHIPPING BAGS**  
*Completely  
Redesigned!*

★ Tear Tape Opener—

★ Golden Clupak \*  
Outer Liner—

★ New Bag Construction

★ NO PRICE INCREASE!



Write for your free sample today!

**JIFFY MANUFACTURING COMPANY**

360 FLORENCE AVENUE, HILLSIDE, N. J.

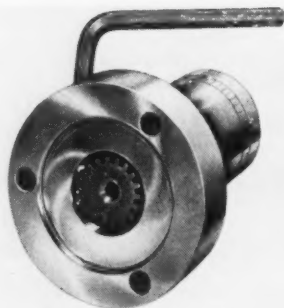
**Jiffy**

\*Clupak, Inc.'s trademark for stretchable paper

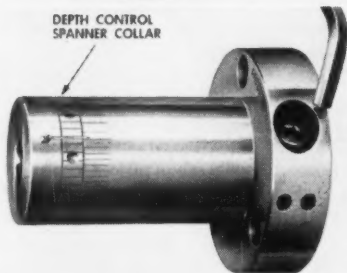
For more data circle 583 on Postpaid Card

306 MODERN MACHINE SHOP

new equipment . . .



DEPTH CONTROL  
SPANNER COLLAR



(Above) Worm-gear drive mechanism connected with bar or bar holder provides a positive drive, preventing backlash and slippage when tool is in use. (Below) New design boring quills permit "splitting tenths" without loosening or tightening any toolholder screws.

1/10,000 inch) to compensate for tool wear on ultra fine tolerance boring jobs, by adjusting with a hex key.

## - DRILLS -

Buy Direct **20%** Discount

on all orders over \$20.00

Money Back Guarantee

Finest Sheffield Steel 18% Tungsten Drills outperform ordinary high speed drills by 20% to 500%. Write for price list today.

**NEWTOLS, INC.**

AM 4-5300

Box TA  
Amityville, L.I., N.Y.

Mr. Pedu

For more data circle 592 on Postpaid Card

May, 1960

These quills eliminate the need of two bearings within the unit. This permits smaller bodies. Adjustment is accomplished by a small worm-gear drive, located within the quill's mounting flange. This drive is engaged with the boring bar or bar holder and a hex key is used to adjust the tool.

A positive drive to the boring bar is provided by the worm-gear hook-up. As in all Briney Boring Quills, there is no backlash and slippage.

For more data circle 153 on Postpaid Card

★ modern machine shop ★

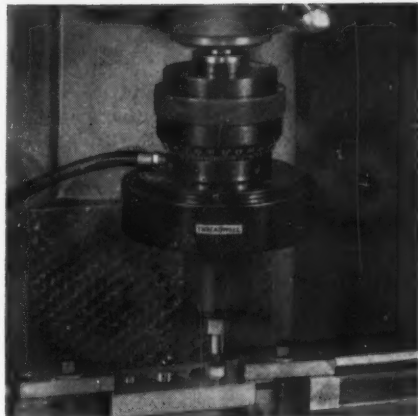
## TWO FLUTE DOUBLE END MILL IS GROUND FROM SOLID

Brown & Sharpe Mfg. Co., Cutting Tool Div., Providence 1, R. I., introduces the Two Flute, Double End Thriftmill.

The Thriftmill is 20 percent lower in initial cost, putting end mills in a "throw away" tool class.

This Thriftmill is ground from solid metallurgically tested high speed steel, has two helical flutes, 30 degree helix, 10 degree rake, is right hand cutting and is recommended for cutting most conventional materials. It is especially suited for profiling, peripheral milling and general end milling work.

The Thriftmill is available as standard, off-the-shelf stock in six sizes, 1/8,



## GRIND-A-MATIC

provides jig grinder performance  
at drill press prices

The new Grind-A-Matic is an air turbine grinding head which can be mounted either vertically or horizontally on almost any machine tool.

Its versatile application and high precision performance allow Grind-A-Matic to perform grinding operations normally done on an expensive jig grinder. Mounted the same as any standard tool, it becomes a close tolerance grinder for such work as internal grinding of tools, dies and fixtures.

- Fine radial adjustment from ".0" to .070 while the spindle is rotating
- Uninterrupted precision grinding
- Coarse adjustment from ".0" through 1 1/4"
- Spindle speeds from 50 to 75,000 RPM
- Standard range from 1/8" to 2 1/2" holes
- Adapted to include holes up to 5 1/2"
- Sealed air turbine and spindle bearings



See your Threadwell Distributor  
or write for free Bulletin

**THREADWELL TAP & DIE CO.**  
**Greenfield, Mass.**



**.0003 HOLE LOCATION IN ONE MINUTE**  
Thousands of companies and individuals have proven and accepted our EDGE FINDERS for years. Ask for literature with users list and dealer in your area. Hardened and ground on all surfaces including contours for balance. .500" size \$2.50. Deluxe .200" size \$10.00. Vise stop for holding same hole location in several pieces \$2.95.  
Above Postpaid Except C.O.D. Charges  
**OPTICAL TANGENT ANGLE & RADIUS DRESSER \$285.00.**  
**1° TO 90° MAGNETIC ANGLE SQ. PIN ANY DIRECTION BLOCK SET, \$198.00.**  
**GLOVER MFG. CO.**  
423 PARK AVENUE                      MEADVILLE, PA.

For more data circle 593 on Postpaid Card

May, 1960

For more data circle 584 on Postpaid Card

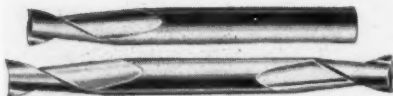
MODERN MACHINE SHOP 307

## new equipment . . .

3/16, 1/4, 5/16, 3/8 and 1/2 inch.

Brown & Sharpe has also introduced a line of two flute, single end, in addition to the four flute Thriftmill already in use.

The two flute Thriftmill is single end, with 30 degree helical flutes, right hand cutting. The shank is made



(Above) Brown and Sharpe Two Flute Thriftmill, (Below) Double End Thriftmill.

the same size diameter as the cut for greater tool rigidity and long life.

It is recommended for most conventional end mill operations and is especially suited for profiling, peripheral milling and general end milling work. It is available from stock in six sizes, 1/8, 3/16, 1/4, 5/16, 3/8 and 1/2 inch. For more data circle 154 on Postpaid Card

★ modern machine shop ★

## AUTOMATIC STAMPING MACHINE

A self-inking automatic stamping machine is announced by Pryor Marking Products, 434 South Wabash Ave.,

## WHEN YOU USE MIST COOLING —USE THE BEST...



### GRAYMILLS MIST COOLANT SYSTEMS

Superbly engineered units of rugged corrosion-proof construction. Dual or single outlets. Precise liquid and air controls. Translucent containers let you see the liquid level. 1 and 2 1/2 gal. sizes for water, coolants or oil.

Write  
today

### GRAYMILLS CORP.

3769 N. LINCOLN AVE., CHICAGO 13, ILL.

For more data circle 594 on Postpaid Card

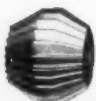
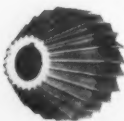
## Here's Real News for Tool Buyers!

### SPECIAL NEW HIGH SPEED CUTTING TOOLS DELIVERED TO YOU WITHIN HOURS INSTEAD OF WEEKS

Are you waiting weeks for your new high speed cutting tools such as milling cutters, end mills, reamers, drills, counterbores, etc., to be manufactured? You can eliminate these bottlenecks in your plant by contacting us, Chicago's cutting tool specialists since 1919, for fast service. Our facilities allow us to modify or change most of our stock catalog tools into specials practically overnight and ship to you with a minimum of waiting time. Try us once and be convinced. Send prints or sketches for immediate quotation. Phone or wire us in an emergency. Orders processed at once. Send for free colorful brochure.

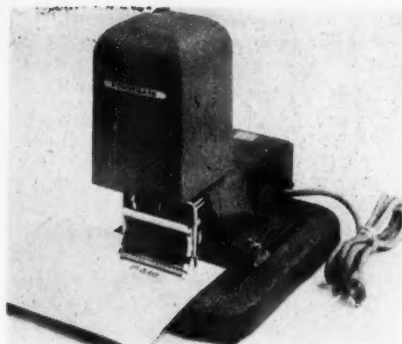
## CTR SALES & GRINDING CO.

1331 N. HALSTED ST. • MICHIGAN 2-6061 • CHICAGO 22, ILL.



For more data circle 585 on Postpaid Card





**Powermark III Automatic Stamping Machine.**

Chicago 5, Illinois. The device utilizes interchangeable rubber base lock type or permanent rubber dies. It imprints a vivid ink impression on form, envelopes, flat cartons or any flat product or material up to  $\frac{1}{8}$  inch thick, automatically. The unit stamps as fast as it can be fed and is available with either automatic type base switch or foot switch.

The base lock rubber type or sticky back rubber dies are quickly and easily removed and replaced for on-the-spot copy changes.

This Powermark III features lightweight cast aluminum body with heavy duty brass imprinting section. It is precision engineered for durability and trouble free operations.

For more data circle 155 on Postpaid Card

## **JIG GRINDING and JIG BORING to your specification**

At your disposal: Our sub-contract jig boring department, one of the best equipped in the East.

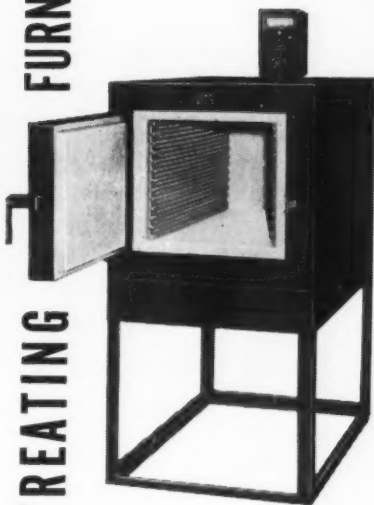
**A. K. TOOL CO., INC.**

ROUTE 22, MOUNTAIN SIDE, N. J.  
Telephone: ADams 2-7300

For more data circle 595 on Postpaid Card

May, 1960

**FURNACE**



**GENERAL PURPOSE HEAT TREATING**

The Lucifer 7055 Series was designed for hardening, annealing, drawing, preheating and special applications. Produced in 13 standard models with heat ranges of 2,000°F. and 2,300°F., the 7055 Series operates on standard line voltage. No transformer is necessary. All models include . . . automatic controls, thermocouple, lead wire, magnetic contactor, horizontal swing door or vertical lift door, positive seal cam lock, cast hearth plate, long-life elements (low watt density), and our exclusive one piece monolithic holders that permit rapid element replacement at a minimum of down-time.

For a free brochure or engineering advice, write, wire or call . . .

**LUCIFER FURNACES, INC.**  
Neshaminy 6, Pennsylvania  
Diamond 3-0411

For more data circle 596 on Postpaid Card

MODERN MACHINE SHOP 309

## new equipment . . .

### COMPARATOR MOUNTS ON GRINDER

A precision optical comparator has been developed by R-O Mfg. Co., 31171 Stephenson Highway, Madison Heights, Mich., for mounting on its R-O Grinder, as well as other makes of grinders by the use of special adaptors. The 9 inch diameter screen is mounted in a protractor ring, which

is graduated and equipped with a 5 minute vernier.

The comparator is supplied with 20x magnification lens and a 20x tool-makers chart, furnished by Inspection Equipment Co. The 20x lens is considered to be standard.

The optics are furnished by Bausch and Lomb Optical Co. The one piece aluminum housing has been designed not only for light weight, but to assure rigid and permanently positioned lens, mirrors, prisms and screen. The lower

reflecting prism is equipped with a dust cover in order to prevent scratching.

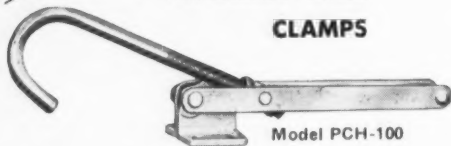
The light source is a Sylvania TruFlector Lamp, designed specifically for the purpose of providing a strong image over the entire screen. A green filter has been provided to emphasize image and to prevent eye strain. Engineered into the light system is an arrangement for dimming the lamp when the unit is not being used for checking. This "coasting" feature contributes to longer lamp life.

The swinging arm, on which the comparator mounts, permits bringing it into the work and swinging it out of



### ELIMINATE BUGABOOS OF CORROSION AND MAGNETISM WITH KNU-VISE STAINLESS STEEL

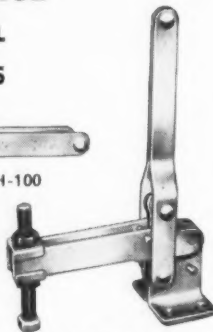
#### CLAMPS



Model PCH-100



Model H-200



Model V-200

All shown 1/4 actual size

Knu-Vise stainless steel toggle clamps eliminate frustrating magnetic attraction and corrosion while spot welding, or while working near acids.

The complete stainless steel line contains 18 clamps with either horizontal, vertical, or T-style handles. There are types for side mounting and pull clamps as well. Write today for complete information. A standard or a special Knu-Vise clamp will probably be the answer to your application.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

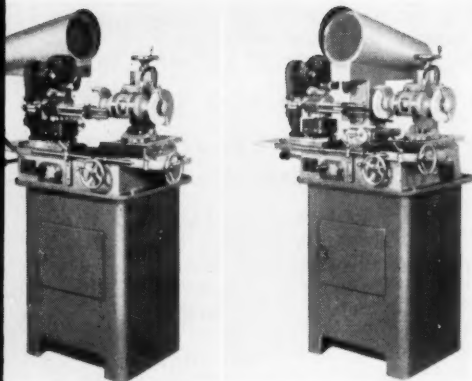
**KNU-VISE  
PRODUCTS**

**LAPEER MANUFACTURING CO.**

3048 DAVISON ROAD  
LAPEER, MICHIGAN

WESTERN DIV.: PECK and LEWIS CORPORATION  
4436 Long Beach Ave., Los Angeles 58, Calif., ADams 3-7146  
CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.  
1131 Pettit Road, Burlington, Ontario

For more data circle 597 on Postpaid Card



(Left) Comparator out of the way for grinding, (Right) In position for checking.

the way without interfering with the setup. It pivots on heavily preloaded Timken bearings, affording minimum mounting deflection. When checking, the arm is firmly positioned against a

gaging button and locked. A slide on the arm permits movement of the comparator, crosswise, for inspecting various areas of the work.

For more data circle 156 on Postpaid Card

★ modern machine shop ★

## SETTING MASTERS ARE MADE TO FIVE MILLIONTHS TOLERANCE

Class XXXX Master Setting Rings and Disks, manufactured to tolerances as fine as five millionths inch, are available from The Sheffield Corp., Dayton 1, Ohio. They are made in both A.G.D. and Sheffield Precision-aire master ring and disk styles.

The new finer tolerance Class XXXX rings and disks are used to calibrate high-amplification Precision-aire Air Gages and other types of precision measurement instruments. Their finer accuracy permits air and electronic gages to be set to classify

## HEATS FAST SAVES TIME

*johnson*

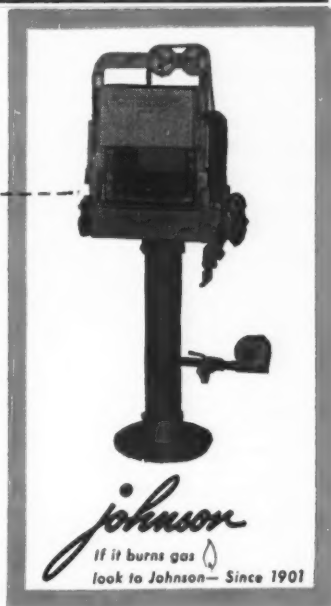
**NUMBER 142 HEAT TREATING FURNACE**

Powerful burners in this efficient furnace get heat up to the 1300°-2350° F. range in minutes. Temperatures accurately and quickly regulated. Does fast job with high speed and carbon steels. Ratchet-operated door opens upward. High temperature, refractory-lined firebox is 7" by 13" by 16½". 200,000 BTUs per hour. Carbofrax hearth, G.E. Motor and Johnson Blower included, F.O.B. Factory .... \$374.00

Write today for free Johnson Catalog

**JOHNSON GAS APPLIANCE COMPANY**  
571 E Avenue NW, Cedar Rapids, Iowa

For more data circle 598 on Postpaid Card



**new equipment . . .**

parts in increments of less than five millionths inch.

Class XXXX rings and disks within size range 0.125 to 0.825 inch are calibrated and certified to accuracy of 0.0000025 by the company's Eli Whitney Metrology Laboratory, while sizes 0.825 to 1.000 inch are calibrated and certified to an accuracy of 0.0000035.

**NOW**  
for the **FIRST TIME**

**REAL  
INTERCHANGEABILITY  
IN UNITIZED TOOLING**

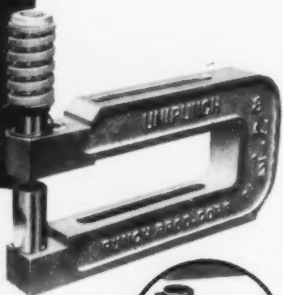
**NEW UNIPUNCH "AJ" Units permit interchangeability with UNIPUNCH "A" Units and with UNITS AND PARTS OF OTHER LEADING MANUFACTURERS**

Unipunch "AJ" Hole Punching Units have the standard 8 3/4" shut height, and 3 1/2" die height, plus 1/4" thick mild steel capacity.

ALL-STEEL HOLDERS have longer life, higher tensile strength, longer wear and greater bearing surface than previously available.

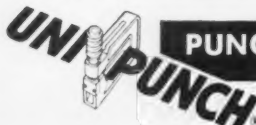
Pedestal Dies are ideal for punching angles, extrusions, channels, and parts with lips and flanges.

Die Adapters provide quick interchangeability of standard inexpensive Die Buttons.



WITH  
PEDESTAL DIE

WITH  
DIE ADAPTER  
FOR DIE BUTTON



**PUNCH PRODUCTS Corporation**

**382 Babcock St., Buffalo 6, N. Y.**

For more data circle 599 on Postpaid Card

The rings are also inspected for circularity, taper and bellmouth.

For more data circle 157 on Postpaid Card

★ modern machine shop ★

**CUTTERS FOR WIRE ROPE  
AND PRESTRESSED CABLE**

T. H. Lewthwaite Machine Co., 317 East 47th St., New York 17, N. Y., announces the addition to its line of a new size cutter for wire rope.

These compound-lever, bench cutters are now manufactured in two sizes. The No. B size will cut 5/8 inch and lighter wire rope and 3/8 inch and lighter prestressed cable. The No. C size is used for cutting 1 1/4 inch and lighter wire rope and prestressed cable larger than 3/8 inch. Blades are made of HCHC steel for long wear.

For more data circle 158 on Postpaid Card

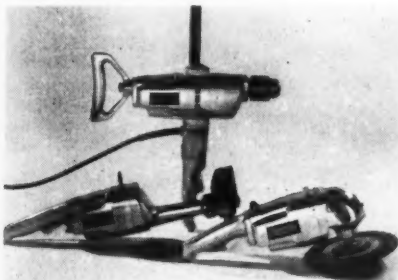


View of Lewthwaite Wire Rope Cutter.

## 16 NEW PORTABLE POWER TOOLS

A completely new line of 16 portable power tools for industrial use is announced by The Stanley Works, Stanley Electric Tools Div., 9105 Elm St., New Britain, Conn. The line includes 10 heavy duty drills, in a range of  $\frac{1}{2}$ ,  $\frac{3}{4}$ , 1 and  $1\frac{1}{4}$  inch sizes; three heavy duty disc sanders in 7 and 9 inch sizes; a 7 inch polisher; and two portable grinders in 5 and 6 inch sizes. Tools are up to 35 percent lighter in weight, up to 100 percent more powerful and have been designed and human engineered to give more effortless operation through precision balance, better control, greater durability and lighter weight. The "soft square" shape identifies them with the company's other products in the Stanley Electric Tools complete line.

Features of the new line include: a new type fan provides extra high speed airflow through the housing for maximum ventilation, minimizes accumulation of dust and abrasives. Handles are engineered for maximum control and balance; the contoured comfortable man-sized grip is designed to control the extra cutting force or torque built into each tool. Sealed integral trigger switches are completely self-contained. There are no screws to turn, no springs to chase. Felt seals are said to lock out abrasive dust and



New line of Stanley Portable Power Tools.

May, 1960

## THE BEST PORTABLE ELEVATING TABLE YOU CAN BUY . . . (Eliminates Cranking)



\*2000 LBS. OR 1000 LBS. CAPACITIES  
\*ILLUSTRATED

### A precision made MIDWEST TABLE Costs no more!

- ✓ It's hydraulic . . . positions work or feeds at desired height without use of hands
- ✓ Rigid cast construction
- ✓ Top turns  $360^\circ$  and clamps
- ✓ Foot release valve to lower
- ✓ Machined top surface can be used as work table.
- ✓ Roller bearing casters with ball bearing swivels
- ✓ Floor clamping available extra

Write today . . . specials on request

## MIDWEST

ENGINEERING COMPANY

114 WEBSTER ST. • DAYTON 2, OHIO  
For more data circle 600 on Postpaid Card

MODERN MACHINE SHOP 313

**new equipment . . .**

prolong switch life, and all trigger switches have locking pins within fingertip control. "Window" brush-holders reveal brush wear without removing brushes from holders.

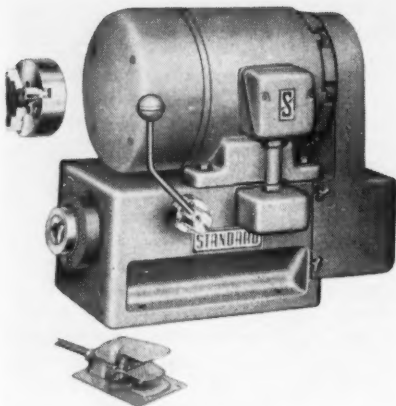
For more data circle 439 on Postpaid Card

★ modern machine shop ★

**BENCH MODEL SPEED LATHE**

The Piggy-Back Belted Motor Drive Speed Lathe, produced by The Standard Electrical Tool Co., 2487 River Rd., Cincinnati 4, Ohio, is of substantial machine tool design, compact in arrangement and versatile in the wide range of spindle speeds available.

This bench model speed lathe delivers continuous heavy duty service on secondary operations such as polishing, burnishing, lapping, spinning, reaming and deburring of small parts.



*Piggy-Back Bench Model Speed Lathe.*

The heavy duty work spindle is ball bearing equipped and permanently lubricated. There is a 1 inch diameter through-hole in the shaft. The spindle

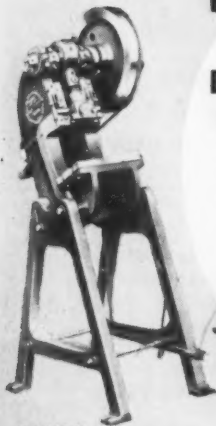
**Moderate  
in Price**

**ALLEN HEAVY DUTY PUNCH PRESSES**

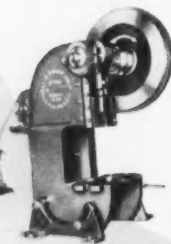
**Powerful  
Dependable  
Economical  
Fully  
Guaranteed**

**Hundreds of different  
Model Combinations  
1 to 12 ton Capacities**

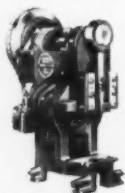
See your Supply Dealer or write for catalog giving complete information, specifications and prices on our line of Heavy Duty Punch Presses.



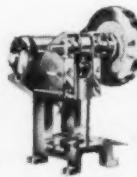
Model BT-12  
12 Ton—\$437.50  
less motor—fob



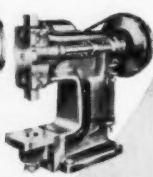
Model BT-8  
8 Ton  
\$347.50  
less motor  
fob



Model BM-4  
4 Ton—\$299.00  
with motor—fob



Model B-2—2 Ton  
\$97.50  
less motor—fob



Model LTX  
Special Duty  
1 Ton—\$89.50  
less motor—fob

**Thousands in Use  
the World Over**

**ALVA ALLEN INDUSTRIES, Dept. M M**  
Clinton, Missouri Tel. TURner 5-3331

For more data circle 601 on Postpaid Card



**SAVAGE**  
**NIBBLING MACHINES**



Patented  
Tool Holder  
Assembly—→

**NIBBLE YOUR COSTS**

- No sparks
- No open flame
- No oxidation • No secondary operations

**No. 236**

Totally enclosed head . . . for safety.  
Direct-over-center positive drive . . . gives more power.  
One-piece 360° revolving head . . . for fewer parts and longer life.

Write for folder


**W. J. SAVAGE CO.**  
KNOXVILLE TENNESSEE

For more data circle 602 on Postpaid Card

**HYBCO**

**TAP GRINDER**

Sharpens Chamfers, Flutes  
and Spiral Points



**MODEL 1100**

- Capacities No. 0 Machine Screw to 2 1/2" Hand Taps. Write for Catalog.

**HENRY P. BOGGIS COMPANY**  
708 E. 163rd St., Cleveland 10, Ohio

For more data circle 603 on Postpaid Card

May, 1960



## KENTRALL Hardness Testers Are Motorized

By removing major test loads automatically, the new motorized Kentralls reduce operator error, increase reproducibility of test results, and raise the productive capacity of the machine—for the same price as hand operated testers.

The motorized Kentralls are available in Combination Testers which provide both Regular and Superficial Rockwell Hardness Testing in a single machine. For those applications that do not require the additional range, Kentrall also makes single purpose testers for either Regular or Superficial testing alone.

**For complete information write  
for Bulletin CRS-60.**

## KENTRALL THE TORSION BALANCE COMPANY

Main Office and Factory:

**CLIFTON, NEW JERSEY**

Sales Offices: Chicago, San Francisco

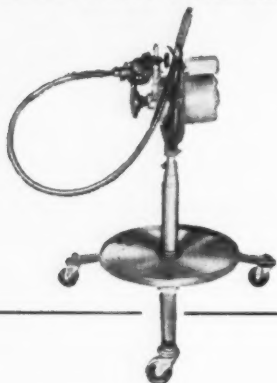
TD-164

For more data circle 604 on Postpaid Card

MODERN MACHINE SHOP 315



**FLEXIBLE SHAFT MACHINES . . .**



- Grinding
- Rotary Filing
- Wire Brushing
- Buffing
- Polishing
- Power Drives
- Remote Controls

with horsepowers from  $\frac{1}{4}$  to 3, with wide range of speeds, shaft sizes; tripod floor mountings, bench or vertical models available for every operation.

The complete flexible shaft machine line

*Send for literature!*

**N. A. STRAND  
FLEXIBLE SHAFT, INC.**

603 So. Washtenaw Ave. Chicago 12, Illinois

For more data circle 605 on Postpaid Card

316 MODERN MACHINE SHOP

## **new equipment . . .**

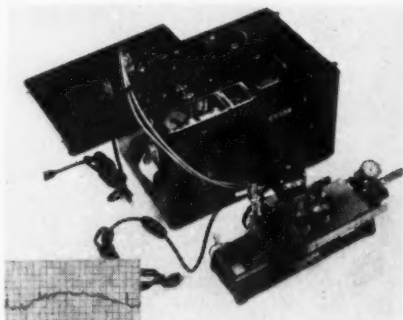
nose accommodates No. 5C draw-in collets up to 1 inch diameter round,  $\frac{7}{8}$  inch hex and  $\frac{3}{4}$  inch square. Hand lever control delivers simultaneous opening/closing of the collet, closing/opening of the motor circuit, with instant applying/releasing of the brake. Partial travel of the hand lever permits manual rotation/inspection of the work. When required, the function can be arranged so that a slight hand lever movement will open the collet while the motor continues to operate.

The versatile feature of this speed lathe is the variation in spindle speed, ranging from 180 to 3,600 r.p.m. Selection can be made for one only speed, a wide range of two speed combinations and also four speed combinations. For more data circle 159 on Postpaid Card

★ modern machine shop ★

## **GEARS TESTED BY ELECTRONICS**

Scherr-Tumico Co., 200 Lafayette St., New York 12, N. Y., introduces an electronic gear tester, using the Sanborn Electronic Recorder coupled with either the Scherr 2 Inch Gear Tester, the Scherr 5 Inch Gear Tester or the Parkson 9 by 15 Inch Gear Testers. The same electronic recorder



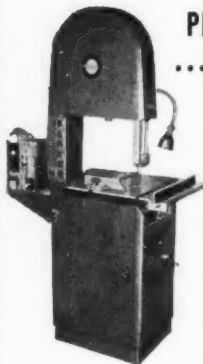
*Scherr-Tumico Electronic Gear Tester.*

May, 1960

## The Universal Cutting Machine **PARKS** M-2 18" Band Saw

Cuts METALS - ALLOYS  
PLASTICS - WOOD

...and it costs  
less than \$500!



Here is a rugged, precision-built machine that will cut any materials you work... at the speed best suited for that material—from 50 to 4200 F.P.M. Dual-Range, fully variable gear drive. Priced to fit any shop budget. Write for literature on band saws, wood planers, and radial saws.

**The PARKS Woodworking Machine Co.**

1511 KNOWLTON ST., CINCINNATI 23, OHIO

Manufacturers of Quality Machines Since 1887

For more data circle 606 on Postpaid Card

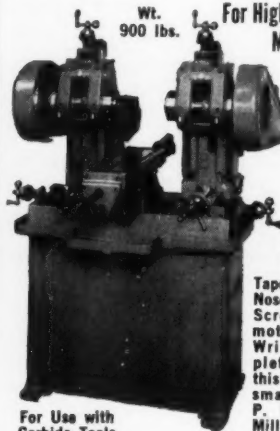
## **BARKER**

DUAL-HEAD  
MILLING MACHINE

Wt.  
900 lbs.

For High Production  
Machining of

Two  
Surfaces  
At Once  
MODEL  
A.M.D.



For Use with  
Carbide Tools

Complete with Pedestal and Two 3/4 H.P. Motors, No. 30 Taper in Spindle Nose. Micro Feed Screws on all motions (Extra). Write for complete data on this mill and our smaller model P. M. D. Dual Mill.

**BARKER ENGINEERING CO.**

Division, The F. Hohlfelder Co.

26470 Lakeland Blvd..

Cleveland 32, O.

For more data circle 607 on Postpaid Card

May, 1960

## LOW COST WAY TO CUT GRINDING COSTS



When you dress grinding wheels regularly you clean loaded pores, uncover fresh abrasive grains — GET NEW PERFORMANCE AGAIN AND AGAIN. Dressing makes every wheel more efficient. In the complete Desmond line there is a dresser to meet your requirement—at low cost. A typical Desmond-Huntington dresser\* costs less than \$3.00; replaceable cutter sets average 36c. Ask your Desmond distributor's advice.

*The only complete line of  
grinding wheel dressers and cutters*

## **Desmond**

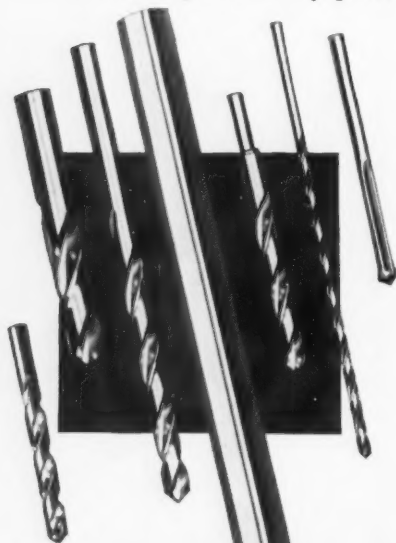
**Desmond-Stephan Mfg. Co.**

**Urbana, Ohio**

For more data circle 608 on Postpaid Card

MODERN MACHINE SHOP 317

*Toughest, hardest, strongest  
... none finer at any price!*



*It pays to specify*

# ACE

**DRILLS  
REAMERS  
BLANKS**

**Premium Quality High Speed Steel  
Carbide Tipped and Solid Carbide**

*Call your local distributor today—or write Ace  
direct for latest catalog and price information.*



**ACE DRILL**  
Adrian, Michigan

ORIGINATORS OF "GROUND-FROM-THE-SOLID" DRILLS

For more data circle 609 on Postpaid Card

318 MODERN MACHINE SHOP

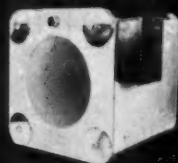
## **new equipment . . .**

can be used on any of the above gear testers simply by mounting a transducer on the gear tester. A separate transducer is required for each gear tester.

The Scherr-Tumico Electronic Recorder can be calibrated to any ratio within the limit of the recording tape. One line on the paper can be made to equal from 0.00005 to 0.001 inch, depending upon the pitch of the gear being checked. A driving motor can be furnished to drive the gear being checked. This motor can be wired to the switch controlling the recording tape, so that both gear and tape operate in unison, or it can be hooked up to an independent switch. The electronic recorder can also be furnished without motor drive.

The recorder uses no ink. It operates with an electrically heated stylus. For more data circle 160 on Postpaid Card

**DEMAGNETIZE TOOLS & PARTS  
MAINTAIN DIMENSIONAL ACCURACY**



## **DYNA-EMPIRE DE-MAG**

Continuous duty operation without overheating.  
Complete demagnetization at production rate up  
to 100 feet/minute.

TWO MODELS AVAILABLE

<b>Model 5</b>	<b>Model 10</b>
Opening—5" dia.	Opening—10" dia.
110V. A.C.—60 cycles	220V. A.C.—60 cycles
4000 Ampere Turns	8000 Ampere Turns
for details write: Dept. MMS-5	



**DYNA-EMPIRE Inc.**  
1025 STEWART AVE., GARDEN CITY, N. Y.

For more data circle 626 on Postpaid Card

May, 1960

**Eliminate costly reading errors with the**

# **"HELIOS"**

## **DIAL VERNIER CALIPER with built-in DIAL INDICATOR**

**Direct Reading in .001"**

The world famous "HELIOS" Dial Vernier Caliper is hardened, ground and lapped throughout.

**Other features:**

- Thumb roll permits quick and easy operation
- Knurled lock screw
- 100% measuring capacity (outside, inside and depth.)

Available in 5", 6", 8" and 10" capacities in tool steel or stainless steel.

Height Gage Attachment optional.

## **"HELIOS" SWING-JAW VERNIER CALIPER**

**with knurled lock screw**

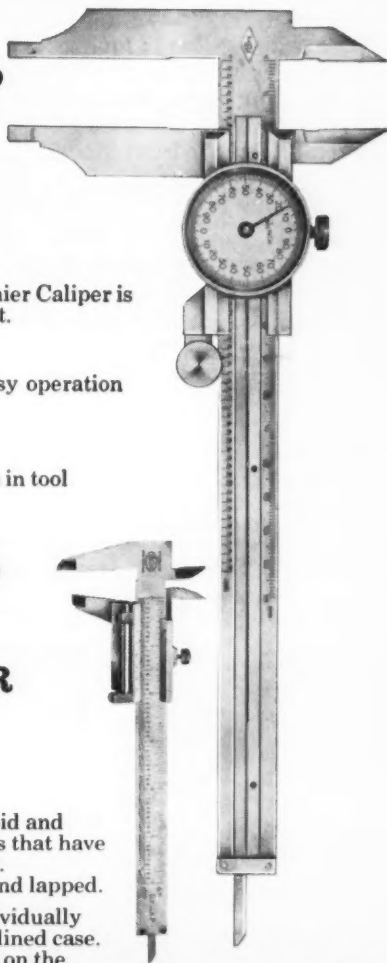
- Direct Reading
- Capacity 4¾"
- Length of Jaw 1⅝"

The swinging jaw allows a very easy, rapid and extremely accurate measurement of parts that have faces which do not lie along the same axis.

This caliper is stainless steel, hardened and lapped.

Every "HELIOS" Vernier Caliper is individually packaged in a beautiful hardwood velvet-lined case. Write for detailed information and prices on the "HELIOS" Caliper line.

*Dealer Inquiries Invited!*



**U.S. REPRESENTATIVES:**

### **M. B. I. EXPORT & IMPORT LTD.**

A DIVISION OF MACHINERY BUILDERS, INC.

**475 Grand Concourse, Bronx 51, N. Y.**



*"Over 25 years' experience in designing and building machinery."*

For more data circle 610 on Postpaid Card

## MICRO DRILLS

from 0.002" — 0.040".  
Spiral and Flat in highest  
precision. Ground from  
the solid and hardened  
rod. Made from Super  
HSS. Supply from stock.

**H. KAPP ENGINEERS**

66-40 108 St., Forest Hills 75, N. Y. Tel.: BO 3-8973

For more data circle 611 on Postpaid Card

## New Ideas in Cutters

★ Designers and manufacturers of H. S. S.,  
tantalum, and carbide cutters based on cost  
saving principles. Form relieved, hard faced  
cutting edges, throwaway inserts, welded bodies,  
semi-finished blanks, clamped-on blades. Serving  
America's metal working, carbon, graphite, valve,  
and instrument manufacturers. Write or phone  
LUdlow 8400 for latest catalog.

### NIAGARA CUTTER

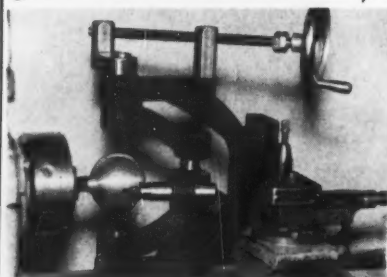
Division of Bollier-Damerell, Inc.  
332 Niagara St., N. Tonawanda, N. Y.



For more data circle 612 on Postpaid Card

New

## RADITURN ✓



### CUTS ANY RADIUS Convex, Concave or Ball

Patented

The accurate short cut for turning any radius.  
Adaptable to most any lathe.  
Contact your tool supplier or write for details.

### RETCO MFG. & SALES

2115 N. Delaware St. • Indianapolis 2, Ind.

For more data circle 613 on Postpaid Card

320 MODERN MACHINE SHOP

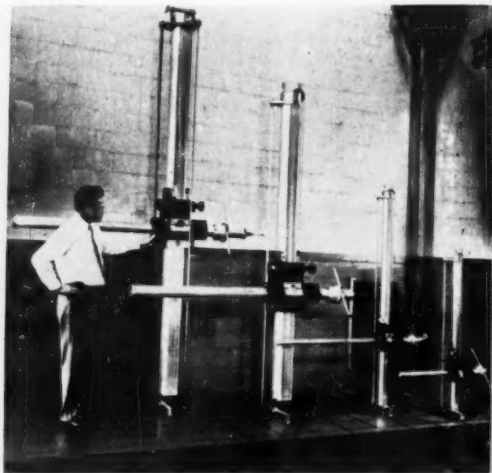
new equipment . . .

## LAYOUT MACHINES

Portage Double Quick, Inc., 1041  
Sweitzer Ave., Akron 11, Ohio, an-  
nounces three new sizes of layout  
machines. Layout work can now be  
done on 2, 4, 6 and 8 foot high cast-  
ings. These machines can quickly  
layout vertical, horizontal, inside or  
outside lines for final machining. The  
workpiece, in most cases, does not have  
to be clamped or moved, once it is  
positioned. Angle plates, protractors  
and other hand tools are completely  
eliminated.

The upright column, cross arm and  
linear attachment are all equipped  
with vernier scales, calibrated to 0.010  
inch increments. Vertical and horizon-  
tal distances from centerlines can be  
established by simply adding or sub-  
tracting from reference points. Guide  
slots in the table base provide an  
accurate guide for machine travel in  
either direction at 90 degrees.

For more data circle 161 on Postpaid Card



Portage Double Quick Layout Machines.

May, 1960

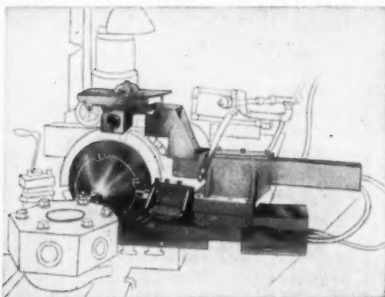




*"a velvet touch and a tiger's response"*

**All MIMIK® Tracers—**

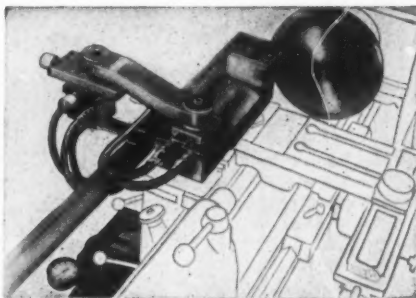
- Have universal positioning.
- Can fit any machine.
- Require only minutes to install.
- Involve no machine tool conversion.
- Are easy to set up.
- Can use templates or round masters.
- Fully guaranteed.
- Have unequalled accuracy.
- Have micrometer settings on X & Y.
- Interchangeable between machines.



MIMIK® can do all these things because its unique valve is so incredibly versatile there is practically no limit to the way it can be applied in a Tracing System.

Your MIMIK® Tracer will pay for itself in months, not years, and not only will slash costs, but will enable your existing machine tools to do work far beyond their present capacity.

**THE RETOR<sup>®</sup>  
MIMIK<sup>®</sup>  
HYDRAULIC  
TRACER**



▲ **"9000" Series for Engine Lathes:**

- Six standard models to fit any lathe.
- Replaces existing compound.

◀ **"5000" Series for Turret Lathes:**

- Rear mounted on ram type.
- Replaces 4-way tool post on saddle type.

▼ **"3000" Series for VTL's:**

- No machine tool conversion.
- Fits into ram or turret like conventional toolholder or replaces tool post on side head.



**U.S. LICENSED MANUFACTURERS.**

East Coast—Farmington Mfg. Co., Farmington, Conn.  
Central—Bartsch Tool Corp., 6570 N. Harlem, Chicago.  
West Coast—Allied Pacific Mfg. Co., 17825 S. Santa Fe Ave., Los Angeles.

Sales Representatives in all major U.S. and Canadian cities.

**CANADA • RETOR DEVELOPMENTS • GALT, ONTARIO**

For more data circle 614 on Postpaid Card

# Where to get it.

**Numbers shown are the page numbers of advertisements and new equipment write-ups which appear in this issue.**

## -A-

**Abrasives, Grain, Cloth, Paper, Disc, etc.,** 21, 58, 59, 109, 115, 202, 230, 275

**Actuators,** 264

**Adapters,** 97, 99, 274, 312

**Agitators,** 333

**Air Operated Equipment**

(Look for specific item)

**Alloys,** 32, 41, 68, 73, 155, 209, 262, 282, 283, 285

**Angles,** 252

**Arbors,** 99

**Automated Equipment**

(Look for specific item)

## -B-

**Bags, Shipping,** 306

**Balancing Machines,** 19

**Bar Machines, Automatic,** 44, 45, 226

**Bars, Boring,** 93, 99

**Bars, Sine,** 284

**Bearings, Ball,** 100, 101

**Bearings, Roller,** 100, 101, 256

**Bearings, Thrust,** 100, 101

**Bending Devices,** 264, 271

**Bending Machines,** 64, 80

**Bevellers,** 223

**Bits, Tool,** 21

**Blades, Cutting-Off,** 107, 169

**Blades, Shear,** 107

**Blocks, Angle,** 307

**Blocks, Step,** 207

**Blocks, Tool,** 99

**Blocks, Vee,** 102, 205

**Bolts,** 207

**Boosters,** 191

**Boring, Drilling, Reaming and Tapping Machines, Combination,** 70

**Boring Heads, Front Cover,** 269, 300

**Boring Machines,** 65, 261, 266

**Boring Mills,** 278

**Brakes, Press and Bending,** 62, 63, 83, 177, 218, 234

**Broaches,** 56

**Broaching Kits,** 56

**Broaching Machines,** 57

**Brushes,** 241, 292

**Buffers, Bench and Pedestal,** 156

**Burs,** 155

**Bushings, Ball,** 174

**Bushings, Drill jig, Inside Front**

Cover, 29, 54

**Bushings, Tap,** 296

## -C-

**Calipers,** 195, 319

**Cams,** 259, 275, 286

**Carbides,** 41, 67, 262, 284

**Cartridges, Tap,** 203

**Centers, Lathe, Planer, Miller, etc.,**

158, 159, 192, 288, 291

**Chamfering Machines,** 64

**Chasers,** 4, 213, 250

**Chip Breakers,** 71

**Chucking Machines, Automatic,** 44, 45

**Chucks, Air and Hydraulic,** 264

**Chucks, Collet,** 86, 87, 99, 302

**Chucks, Diaphragm,** 99

**Chucks, Gear,** 323

**Chucks, Lathe,** 302

**Chucks, Power,** 163, 323

**Chucks, Scroll,** 323

**Chucks, Universal,** 103

**Circulators,** 333

**Clamps,** 207, 271, 291, 294, 298, 310

**Collet Closers,** 296

**Collets,** 86, 87, 99, 231

**Comparators,** 106, 208, 213, 305, 310

**Controlling Devices,** 233

**Coolant Separators,** 187

**Coolant Units and Systems,** 186, 248, 256, 308

**Coolants,** 194, 294

**Counterbores,** 27, 35, 82, 165, 275, 308

**Countersinks,** 107

**Cut Off Machines,** 92, 185, 244, 325

**Cutters, Gear,** 151

**Cutters, Inserted Blades and Tooth,** 151

# Take a CLOSE Look!



## ***This Buck feature TRIPLES chuck life—Keyway gibs take up wear***

You have some unbeatable profit-making features going for you with Buck Aluminum Body chucks. The easily-adjusted gibs to take up wear and prevent bell-mouthing are just one advantage.

Aluminum body and new design master jaws *save 40% of conventional chuck weight*...increase efficiency, save machine wear.

.001" precision is guaranteed by the famous Buck Adjust-Tru principle that permits *machining jaws in the tool room* and final precision adjustment *under full gripping pressure*.

Front plate, ways, master jaws, gibs are all hardened and ground and thoroughly lubricated.

These unique new power chucks are another reason why—"You make money every time you chuck with Buck." Send for a catalog—see for yourself.

Aluminum Body power chucks are available in diameters up to 18". Also see the Scroll, Independent, Dust-Proof, and Gear chucks.

### **BUCK TOOL COMPANY**

514 SCHIPPERS LANE • KALAMAZOO, MICH.

For more data circle 615 on Postpaid Card

**where to get it . . .** (Numbers shown are page numbers in this issue)

**Cutters, Milling,** 17, 35, 82, 151, 197,  
208, 303, 308, 320

**Cutters, Wire Rope and Cable,** 312  
**Cylinders, Hydraulic and Pneumatic,**  
96, 240, 262

#### **-D-**

**Deburring Machines,** 64  
**Demagnetizers,** 318  
**Diamonds and Diamond Tools,** 41, 289  
**Die Casting Machines,** 226  
**Die Filers,** 210  
**Die Heads,** 4, 250  
**Die Lifting and Handling Machines,**  
246, 269  
**Dieing Machines,** 49  
**Dies, Punching or Forming,** 17, 33, 34,  
82, 88, 114, 150, 165, 177, 218, 262,  
266, 277, 300, 312  
**Discs,** 107, 230  
**Dressers, Grinding Wheel,** 289  
**Dressing Fixtures, Grinding Wheel,**  
26, 158, 159, 243, 270, 295, 307, 317  
**Drill Heads,** 119, 174, 258  
**Drill Jigs,** 192, 286  
**Drill Sharpening Fixtures,** 52, 53  
**Drilling Attachments,** 20, 225, 258, 274  
**Drilling and Tapping Machines,**  
Combination, 9, 226  
**Drilling Machines, Bench,** 9, 20  
**Drilling Machines, Multiple Spindle,**  
20  
**Drilling Machines, Radial,** 14, 51  
**Drilling Machines, Sensitive,** 20  
**Drilling Machines, Turret,** 9, 224  
**Drilling Machines, Vertical,** 20, 98, 111  
**Drilling Units,** 119, 258  
**Drills, Center, Core, Twist, etc.,** 17, 21,  
33, 35, 82, 107, 151, 165, 232, 289,  
294, 306, 308, 318, 320  
**Drills, Portable Electric,** 313  
**Drivers, Torque,** 200  
**Dump Carts,** 269  
**Dust Control Equipment,** 211, 238

#### **-E-**

**Edge Finders,** 307  
**End Mills,** 17, 21, 35, 82, 105, 151, 165,  
197, 304, 307, 308  
**Engraving Attachments,** 60  
**Engraving Machines,** 60, 267  
**Expanding Machines,** 300  
**Extensions,** 301

#### **-F-**

**Fabricators,** 272  
**Facing Heads,** 210  
**Feed Units,** 335  
**Feeding Machines,** 228  
**Files,** 155  
**Filing Machines,** 74  
**Finishing and Sanding Machines,**  
Combination, 228  
**Finishing Machines,** 113, 241  
**Flats, Glass Optical,** 219  
**Flexible Shaft Equipment,** 119, 316  
**Fluids, Cutting,** 199, 201  
**Forgings,** 61  
**Forming Machines,** 77, 218, 331  
**Furnaces, Heat Treating,** 230, 263,  
309, 311

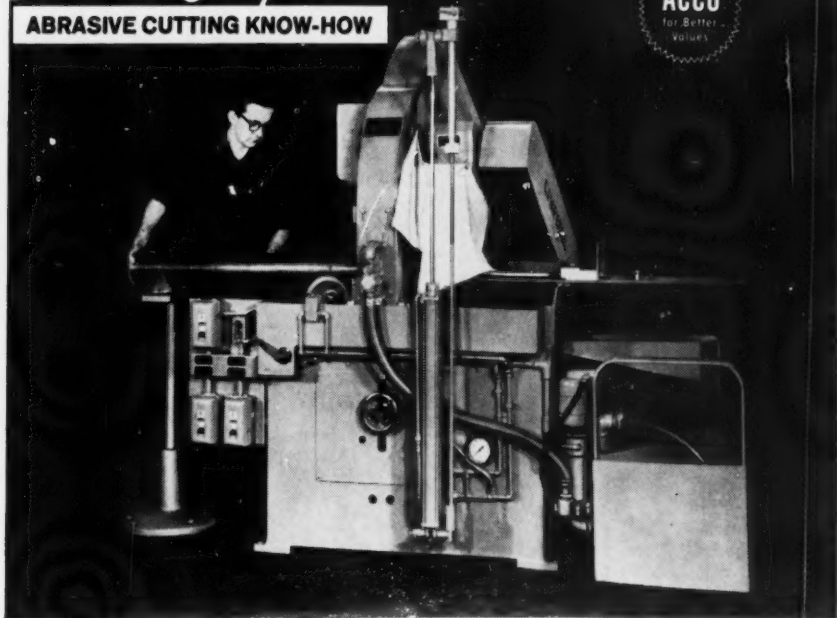
#### **-G-**

**Gage Accessories,** 213, 237, 276, 311  
**Gage Blocks,** 40, 157, 265  
**Gages,** 21, 33, 34, 46, 50, 82, 110, 150,  
195, 208, 213, 233, 237, 276, 290, 303,  
305, 311, 319  
**Gear Cutting Machines,** 78, 79  
**Gear Measuring Instruments and**  
**Machines,** 78, 79  
**Gear Rolling Machines,** 74  
**Gear Testing Devices,** 316  
**Generators,** 248, 256  
**Grinders, Abrasive Band and Belt,**  
273, 290  
**Grinders, Angular Wheel Slide,** 250  
**Grinders, Bench,** 156  
**Grinders, Center Type,** 10, 11  
**Grinders, Centerless,** 10, 11  
**Grinders, Chucking,** 10, 11  
**Grinders, Contour,** 220  
**Grinders, Die and Mold,** 234, 296  
**Grinders, Drill,** 119  
**Grinders, Gear,** 78, 79  
**Grinders, Hand,** 119  
**Grinders, Jig,** 26  
**Grinders, Pedestal,** 156  
**Grinders, Portable Electric,** 313  
**Grinders, Portable Pneumatic,** 255  
**Grinders, Profile,** 210  
**Grinders, Roll,** 10, 11  
**Grinders, Surface,** 7, 25, 69, 112, 171,  
240, 247, 268, 327  
**Grinders, Tap,** 315  
**Grinders, Tool Post,** 287  
**Grinding Compounds,** 199, 201, 275

# Allison-Campbell

## ABRASIVE CUTTING KNOW-HOW

ACCO  
For Better  
Values



### With this Campbell Machine, you can -- Cut 6-inch Diameter Hard Alloys in Less than 3 Minutes!

• **This Campbell wet abrasive cutting machine—the Model 406**—will cut tubing, bar stock, angle iron, or any other shape up to 6" round or square—and it will cut practically any material, including the new super alloys and exotic metals.

**High speed** • 4 to 8 seconds per square inch is normal wet abrasive cutting speed. Cut 6" diameter hardened steel in less than 3 minutes. **Accuracy** • Model 406 will cut 3" diameter material to lengths within  $\pm .010"$ , 6" diameter within  $\pm .030"$ . **Fine finish** • No burn, minimum burr. **Power oscillation** • Cutting wheel moves back and forth across cut as wheel is fed downward. Result—greater cutting capacity, longer wheel life.

**Proper coolant application** • Large reservoir, 33 gallon/min. pump, give high coolant volume. Unique Campbell distributor applies coolant equally to both sides of wheel—a requirement for accurate cuts.

**OTHER CAMPBELL MACHINES FOR ANY CUT-OFF NEED** • Choose from four types of Campbell machines for wet or dry cutting—chop stroke, oscillating, horizontal or rotary—with capacities up to 14" rounds, 12" billets, plate up to 6" thick and 20 ft. long.

*Write* for Bulletin DH-260 for details on the Model 406, or describe your cut-off application and we'll send you information on the proper Campbell machine.



## CAMPBELL ABRASIVE CUTTING MACHINES

Allison-Campbell Division • American Chain & Cable Company, Inc.

931 Connecticut Avenue, Bridgeport 2, Conn.

For more data circle 616 on Postpaid Card

**where to get it . . .** (Numbers shown are page numbers in this issue)

**Grinding Fixtures and Attachments.**

23  
Grinding Heads, 307  
Grinding Wheels, 55, 58, 59, 109, 112,  
292  
Guns, Air, 284  
Guns, Spray, 81

**-H-**

Hammers, Hand, 155, 190  
Hand Tools, Power  
(Look for specific item)  
Handles, Hammer, 271  
Handles, Machine, 252  
Handwheels, 252  
Hardness Testing Devices, 193, 204,  
315  
Hats, Safety, 252  
Hinges, 268  
Hobbers, Gear, 78, 79  
Hobs, 35, 82, 151, 165, 208  
Hoisting and Conveying Machinery,  
175  
Holders, Tap, 249  
Holders, Tool, 21, 94, 97, 99, 123, 192,  
282, 286, 295, 301  
Holders, Work, 205  
Honing Machines, 13, 90  
Hydraulic Equipment  
(Look for specific item)

**-I-**

Indexing Machines, 226  
Indicators, 46, 195, 233, 235, 237, 288

**-J-**

Jaws, Chuck, 99  
Jig and Fixture Components, 207  
Jig Borers, 26, 254  
Jigs and Fixtures, 296

**-K-**

Keys, Machine, 216, 283  
Keys, Socket Screw, 262  
Keys, Woodruff, 283  
Keyway Cutting Machines, 299  
Knives, 107, 217  
Knobs, Hand, 207, 252  
Knurlers, Hand, 212

**-L-**

Lapping Compounds, 275  
Lathe Attachments, 42, 43  
Lathes, Automatic, 15, 19  
Lathes, Engine and Toolroom, 6, 8, 38,  
39, 42, 43, 52, 53, 222, 229, 279  
Lathes, Speed, 314  
Lathes, Threading, 19  
Lathes, Tracer, 222  
Lathes, Turret, 15, 19, 258  
Layout Machines, 320  
Layout Materials, 267  
Lighting Equipment, 219, 288  
Lubricants, 72, 116, 194, 277

**-M-**

Machining Units, Portable, 119, 254  
Magnifiers, 251  
Mandrels, Expanding, 99  
Marking Devices, 215, 245, 259, 303,  
308  
Measuring Instruments, Optical, 228  
Measuring Instruments, Surface  
Roughness, 280  
Metallizing Equipment, 81  
Micrometers, 195  
Microscopes, 253  
Milling Attachments, 205  
Milling Machines, Automatic, 227  
Milling Machines, Bench, 276, 317  
Milling Machines, Double Head,  
287, 317  
Milling Machines, Hand, 91, 276  
Milling Machines, Horizontal, 16, 248  
Milling Machines, Universal, 16, 248  
Milling Machines, Vertical, 104, 248,  
276  
Mills, Face, 197  
Mills, Midget, 234  
Mounted Wheels and Points, 292, 338

**-N-**

Nibblers, 263, 278, 294, 315  
Notching Units, 268  
Nuts, 207  
Nuts, Tee, 207

**-O-**

Ovens, 263



# WANT SOMETHING **EXTRA** in a **SURFACE GRINDER**

?? ? ? ? ? ? ?

- 1 Superior Accuracy
- 2 Sturdy Construction
- 3 Low Cost

You get ALL 3  
in a  
**BOYAR-SCHULTZ**

Extra precision, extra sturdiness and low cost mean **EXTRA VALUE.**

This is a precision machine tool, specially designed and built to provide the same close tolerance accuracy usually found only in larger and costlier machines.

The Boyar-Schultz 6 x 12 Surface Grinder has many exclusive features found in no grinder of the same size.

Available in both hydraulic and hand feed.

HYDRAULIC FEED MODEL

WRITE FOR OUR NEW CIRCULAR

**BOYAR-SCHULTZ CORPORATION**

2020 SOUTH 25TH AVENUE

BROADVIEW, ILLINOIS

For more data circle 617 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 327



where to get it . . . (Numbers shown are page numbers in this issue)

**-P-**

Pantographs, 60  
Parallels, 102, 252  
Parts, Machine Tool, Production,  
Aircraft, etc., 76, 216  
Penetrators, Diamond, Ball, etc., 193  
Pins, Dowel, Taper, etc., 198, 242, 272,  
283, 297  
Planers, 260, 317  
Plate and Sheet Working Machines,  
266  
Plates, Angle, 277  
Plates, Screw, 150  
Plates, Sine, 284  
Plates, Surface, 252, 257  
Pliers, 310  
Polishers, Portable Electric, 313  
Positioning Fixtures and Devices,  
51, 181  
Presses, Bench, 85  
Presses, Die, 222  
Presses, Drawing, 83  
Presses, Electric, 329  
Presses, Hydraulic, 28, 224, 270, 299,  
329  
Presses, Power, 83, 114, 236, 281, 286  
Presses, Punch, 5, 314  
Presses, Trim, 226  
Profilers, 302  
Projectors, Optical, 257  
Pumps, Coolant and Lubricant, 333  
Pumps, Molten Metal, 333  
Punches, 114, 277, 282, 300  
Punching Units, 312  
Pyrometer Calibrating Sets, 293

**-Q-**

Quills, 119, 305

**-R-**

Racks, Machine, 283  
Reamers, 17, 21, 33, 35, 82, 107, 151,  
165, 273, 297, 308, 318  
Recorders, 233  
Reels, 244  
Refractories, 58, 59, 109  
Rings, Truing, 192  
Rivet Spinner Heads, 254  
Riveting Machines, 270  
Rolls, 227

**-S-**

Sanders, Portable Electric, 313  
Sanders, Portable Pneumatic, 236  
Saw Blades, Band, 149, 155, 173, 339  
Saw Blades, Hack, 24, 155  
Saw Blades, Hand, 84  
Saw Blades, Hole, 293  
Saw Blades, Slitting, 17, 107  
Sawing and Filing Machines,  
Combination, 30  
Sawing Machines, Band, 74, 240, 317  
Sawing Machines, Hack, 24  
Sawing Machines, Radial, 317  
Screw Machines, 99  
Screws, Cap, Set, Socket and  
Machine, 18, 207, Back Cover  
Screws, Transfer, 272, 300  
Segments, Grinding, 112  
Separators, Magnetic, 279  
Services: Milling, Grinding, Lapping,  
Rebuilding, Repairing, Business,  
etc., 15, 19, 50, 76, 100, 101, 253,  
259, 271, 275, 286, 287, 294, 300, 309  
Shapers, 62, 63, 249  
Sharpening Machines, Cutter, 36, 37  
Sharpening Machines, Hob, 36, 37  
Sharpening Machines, Saw, 260  
Shearing Machines, 62, 63, 83, Inside  
Back Cover  
Shears, Hand, 298  
Sleeves, 99  
Spacers, 266  
Special Machinery, 78, 79, 193, 226,  
285  
Spindles: Grinding, Boring, Milling,  
etc., 12, 99, 253, 298, 340  
Springs, 196, 252  
Stampings, 66  
Steel, Die, 68, 73, 283  
Steel, Stainless, 73  
Steel, Tool, 32, 73, 209, 282  
Steel Stock, Ground Flat, 155, 209, 282  
Stools, 238  
Straightedges, 252  
Straightening Machines, 254, 265  
Stud Sets, 207  
Studs, 207  
Superfinishing Machines, 19

**-T-**

Tables, Elevating, 269, 313  
Tables, Rotary and Index, 26, 205, 223,  
277, 283, 289, 298

# New ACCO Electric Presses for heavy industrial work - 8 models to choose from

Expressly designed to do a wide variety of industrial press jobs at low capital investment, new ACCO electrically powered hydraulic presses turn out jobs with ease and safety—and on a continuous duty cycle. Frame members are fabricated from selected structural steel for maximum rigidity and minimum deflection. Convenient hand wheel brings ram in rapid contact with the job, saving the full power stroke for pressing. Here are a few of the other outstanding features and advantages that ACCO presses offer:

- Motor and radial piston pump in single integral unit can be run continuously
- Pre-set safety valve prevents overload. Limit control prevents over-travel of ram
- Closed hydraulic system cannot become contaminated
- Prominent Helicoid gauge gives operator accurate pressure reading at all times
- Self-locking, screw-gearred winch with sealed lubrication moves work table over broad range of travel
- Available in 25, 40, 60, 80 and 150 ton capacities

For complete details, contact your ACCO Equipment distributor. If you don't know his name, write us at York, Pa., we will send full details.

**ACCO**

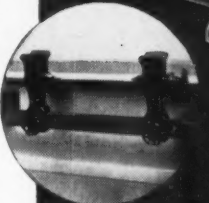
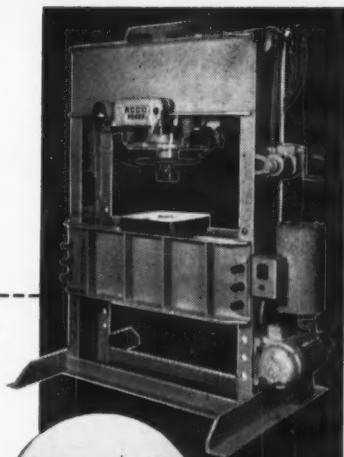


## ACCO HYDRAULIC PRESSES

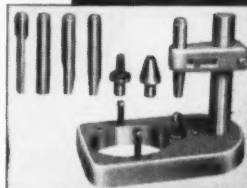
Acco Equipment Division • American Chain & Cable Company, Inc.

York, Pa., Chicago, New York, Denver, San Francisco, Bridgeport, Conn.

For more data circle 618 on Postpaid Card



**Universal Test Centers**  
For checking run-out of shafts and axles



**Rivet Upsetting Tool**  
For hot and cold rivet upsetting



**Auxiliary Arbor Press**  
3-ton capacity  
...for light jobs...  
available with all models

**where to get it . . .** (Numbers shown are page numbers in this issue)

Tap Extractors, 301  
Tap Guide, 260  
Tapes, Pressure Sensitive, 58, 59, 109  
Tappers, Automatic, 174  
Tappers, Hand, 276  
Tapping Attachments, 167, 255, 274  
Tapping Heads, 167  
Tapping Units, 119, 255, 258  
Taps, 4, 17, 21, 33, 34, 75, 82, 89, 108,  
150, 165, 208, 239, 280  
Tips, Carbide, 262  
Tool Blanks, 21, 318  
Tool Kits, 295  
Tool Posts, 94  
Tools, Boring, 93, 300  
Tools, Brushing, 292  
Tools, Burnishing, 31  
Tools, Carbide, 21, 35, 82, 107, 151,  
165, 169, 173, 212, 234, 262, 318, 320,  
339  
Tools, Chamfering, 22, 274, 304  
Tools, Deburring, 22, 274, 304  
Tools, Facing, 22  
Tools, Honing, 13  
Tools, Radius, 242

Tools, Recessing, 95, 183  
Tools, Special Cutting, 17, 35, 212  
Tools, Threading, 4  
Tracers, Lathe, 321, 337  
Transfer Processing Machines,  
Automatic, 226  
Turning Attachments, Radius, 320  
Turrets, Lathe, Tool Post, Bed and  
Tailstock, 261

**- V -**

Valves, 47, 246, 257, 289  
Vises, Bench and Machine, 192, 205,  
281, 290

**- W -**

Washers, 207  
Wear Parts, 262  
Welding Equipment and Supplies,  
74, 299  
Wet Blast Units, 297  
Wrenches, 61, 283

## "ONE HOE FOR KALABO"

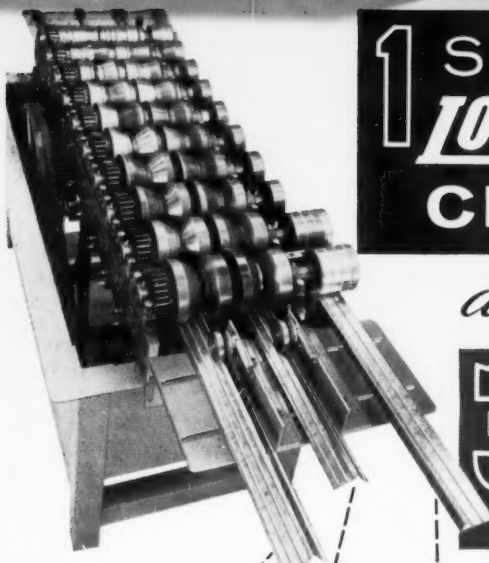
Sound and color 16 mm. movie film telling what machine tools are and what they do.

Culmination of several years of planning and production by the machine tool industry.

Designed primarily as a public education project.

Copy of film is available on free loan basis for showing to groups. Requests should be directed to Film Editor, Modern Machine Shop, 431 Main Street, Cincinnati 2, Ohio, and should specify the date of showing, the name of the organization requesting the film, the individual to whom the film should be addressed, address and telephone number.

## MODERN MACHINE SHOP



# 1 Standard **LOCKFORMER** CHASSIS

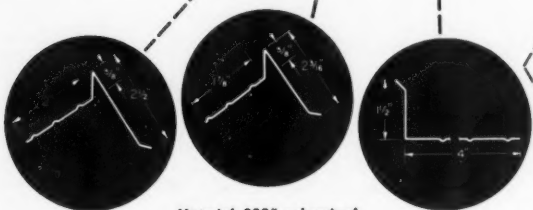
*and*

# 3 SETS OF Custom ROLLS

*produce*

# THESE 3 PARTS

(One at a time, or all at once)



Material .023" galvanized

...another example of how you can equip your shop for custom roll forming at savings up to 75%!

When you order custom rolls on a *standard* Lockformer chassis, you by-pass the high development and engineering costs you normally expect with a special sheet metal forming machine. Thus, you get the equivalent of a custom designed machine at just a little more than the cost of a standard Lockformer.

What's more, standard low-cost parts will always be available for the *standard* Lockformer chassis. And the machine will never

require special set-ups or special operator skills. Lockformers equipped for custom roll forming are as simple to operate, as easy and economical to maintain as standard Lockformers (the ones that have been making extra profits in thousands of shops for 30 years).

Why not send us a print and description of your next special forming job? We'll give you some exact figures on what you need and what you save in time and money by tooling up Lockformer style. No obligation. Ask for the new Lockformer Catalog, too.

For more data, circle  
619 on Postpaid Card



manufactured by



**THE LOCKFORMER COMPANY**  
Dept. MS 4615 West Roosevelt Road  
Chicago 50, Illinois

In Canada: Brown Baggis Foundry & Machine Co., Ltd., Hamilton, Ont.

# INDEX to advertisements

## -A-

A. K. Tool Co., Inc.	309
ACCO Equipment Div.,	
American Chain & Cable Co., Inc.	329
Ace Drill	318
Ace Drill Bushing Co.	29
Acme Industrial Co.	76
Acme Tool Corp.	282
Adamas Carbide Corp.	262
Adjustable Clamp Co.	298
Advance Products Corp.	298
Aget Mfg. Co.	211
Airborne Instruments Laboratory	235
Airetool Mfg. Co.	234
Airway Pump & Equipment Co.	284
Alina Corp.	195
Allegheny Ludlum Steel Corp.	32
Allen Industries, Alva	314
Allen Mfg. Co.	18
Allison-Campbell Div.,	
American Chain & Cable Co., Inc.	325
Aloris Tool Co., Inc.	94
Alpha Molykote Corp.	72
American Chain & Cable Co., Inc.,	
ACCO Equipment Div.	329
Allison-Campbell Div.	325
Wilson Mechanical Instrument Div.	193
American Drill Bushing Co., Inc.	Second Cover
American Saw & Mfg. Co.	149
American Tool Wks. Co.	51
Ames Co., B. C.	233
Anton Machine Wks.	205
Apex Broach Co., Inc.	57
Armstrong-Blum Mfg. Co.	24
Armstrong Bros. Tool Co.	123
Atlas Press Co., Clausing Div.	8, 103
Austin Industrial Corp.	248, 249
Auto Moulding & Mfg. Co.	268
Avey Div. of Match &	
Merryweather Mchry. Co.	98

## -B-

Backus Machine Wks.	244
Bald Eagle Products Div.	284
Bar Products Co.	256
Barber-Colman Co.	36, 37

Barker Engr. Co.,	
Div. of F. Hohlfelder Co.	317
Barnes Co., Inc., W. O.	84
Bearings, Inc.	100, 101
Bellows Co.	96
Besly-Welles Corp.	21
Black Drill Co.	232
Blanchard Machine Co.	112
Boggis Co., H. P.	315
Bokum Tool Co.	First Cover
Boyar-Schultz Corp.	327
Branch Mfg. Co.	260
Bremil Mfg. Co.	298
Brightboy Industrial Div.,	
Weldon Roberts Rubber Co.	115
Buck Tool Co.	323
Burgmaster Corp.	9
Busch Co., J. C.	252
Butterfield Div., Union Twist Drill Co.	165
Byco Industries	296

## -C-

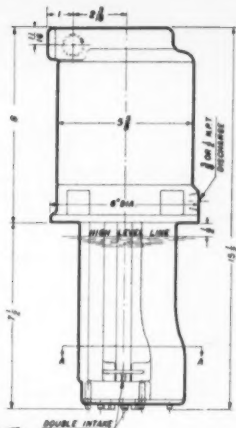
CTR Sales & Grinding Co.	308
Capewell Mfg. Co.	173
Card Div., S. W., Union Twist Drill Co.	150
Carlton Machine Tool Co.	14
Chicago Heights Steel Co.	71
Chicago Mfg. & Dist. Co.	116
Chicago Tool & Engr. Co.	205
Cincinnati Gilbert Machine Tool Co.	283
Cincinnati Lathe & Tool Co.	52, 53
Cincinnati Milling Machine Co.	10, 11
Cincinnati Milling Machine Co.,	
Cincinnati Milling Products Div.	55
Cincinnati Shaper Co.	62, 63
Circular Tool Co.	107
Clausing Div., Atlas Press Co.	8, 103
Cleveland Crane & Engr. Co.	83
Cleveland Punch & Shear Wks. Co.	114
Clover Mfg. Co.	275
Cogsdill Tool Products, Inc.	22
Commander Mfg. Co.	258
Comfor Co.	110
Continental Tool Wks.,	
Div. of Ex-Cell-O Corp.	27
Cook Lead Hammer Service	271
Cooper-Weymouth, Inc.	254



# Check

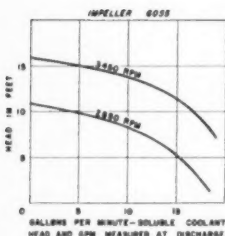
## ✓ SOUND DESIGN

Designed right, with all the experience that has made Ruthman Gusher Coolant Pumps the leader in their field, Baby Gushers are ideal for machines requiring a nominal volume of coolant.



## ✓ ECONOMICAL PERFORMANCE

Your Baby Gusher will give you excellent and economical performance on your metal cutting equipment. Pumps up to 25 gallons per minute at 15 foot head. Uses less power when throttled—requires no priming. Coolant flow starts instantly.



## ✓ LONG LIFE AT MODERATE COST

The original cost of your Baby Gusher is moderate . . . maintenance cost is at an absolute minimum. Pre-lubricated ball bearings need no further attention. No packing or seals. There are fewer parts to wear. No metal to metal contact.

Model  
6-P-3  
IMMERSED  
TYPE



You Get All 3 with a

### BABY GUSHER

Write for Catalog.

# THE Ruthman

Other models of  
Baby Gusher and  
Tank Unit available.

## MACHINERY CO.

- COOLANT PUMPS
- CIRCULATORS • AGITATORS
- MOLTEN METAL PUMPS

1816 READING ROAD

CINCINNATI, OHIO

For more data circle 620 on Postpaid Card

May, 1960

MODERN MACHINE SHOP 333

Covel Mfg. Co. ....	25
Crane Packing Co. ....	219
Cratex Mfg. Co. ....	202

## -D-

Dearborn Gage Co. ....	157
Delta Power Tool Div., Rockwell Mfg. Co. ..	20
Desmond-Stephan Mfg. Co. ....	317
DeVlieg Microbore, Div. of DeVlieg Machine Co. ....	93
Dixie Bearings, Inc. ....	100, 101
Dreis & Krump Mfg. Co. ....	218
Dugas Machine Wks., Inc. ....	266
duMont Corp. ....	56
Dumore Precision Tools ....	119
Durant Tool Co. ....	242
Dykem Co. ....	267
Dyna-Empire, Inc. ....	318

## -E-

Eastern Machine Screw Corp. ....	250
Eclipse Counterbore Co. ....	105
Economy Engr. Co. ....	246
Edroy Products Co. ....	251
Eisler Engr. Co., Inc. ....	259
Empire Tool Co. ....	169
Enco Mfg. Co. ....	261
Ex-Cell-O Corp. ....	27

## -F-

Federal-Bryant Mchry. Co. ....	274
Federal Products Corp. ....	46
Fellows Gear Shaper Co. ....	78, 79
Fenway Machine Co. ....	278
Field Tool Supply Co. ....	33
Fiske Bros. Refining Co. ....	194
Flick-Reedy Corp., Miller Fluid Power Div. ....	191
Flynn Mfg. Co. ....	300
Fosdick Machine Tool Co. ....	65
Foster Supplies Co. ....	237
Fostoria Corp. ....	288
Fulflo Specialties Co., Inc. ....	47
Fulmer Co., C. Allen. ....	90

## -G-

Gaertner Scientific Corp. ....	228
Gammans-Hoaglund Co. ....	297
Gillen Co., John ....	216
Gisholt Machine Co. ....	15, 19
Glover Mfg. Co. ....	307
Grant Mfg. & Machine Co. ....	270

Graymills Corp. ....	308
Greaves Machine Tool Co. ....	16
Green Instrument Co., Inc. ....	60
Greenfield Tap & Die ....	89
Greenlee Bros. & Co. ....	226
Grob, Inc. ....	74

## -H-

H & H Engr. Co. ....	266
Hamilton Tool Co. ....	181
Hammond Mchry. Builders, Inc. ....	273
Hanchett Magna-Lock Corp. ....	102
Hannifin Co., Div. of Parker-Hannifin Corp. ....	85
Hanson-Whitney Co. ....	208
Harco Engr. Co. ....	291
Harig Mfg. Co. ....	171
Heimann Mfg. Co. ....	272
Heuser Mfg. Co. ....	286
Hill Acme Co. ....	214, 217
Himoff Machine Co., Inc. ....	275
Haglund Engr. & Mfg. Co. ....	243
Holo-Krome Screw Corp. ....	Fourth Cover
Hossfeld Mfg. Co. ....	271
Houston Grinding & Mfg. Co., Inc. ....	291
Huppert Co., K. H. ....	263
Hydraulic Press Mfg. Co. ....	49
Hy-Pro Tool Co. ....	75

## -I-

Index Machine Co. ....	104
Insta-Clamp Co. ....	294

## -J-

J & S Tool Co., Inc. ....	158, 159
Jacobs Mfg. Co. ....	86, 87
Jarvis Corp. ....	239
Jeon Mfg. Co. ....	270
Jiffy Mfg. Co. ....	306
Johnson Gas Appliance Co. ....	311
Johnson Machine & Press Corp. ....	286
Jones & Lamson Machine Co. ....	106

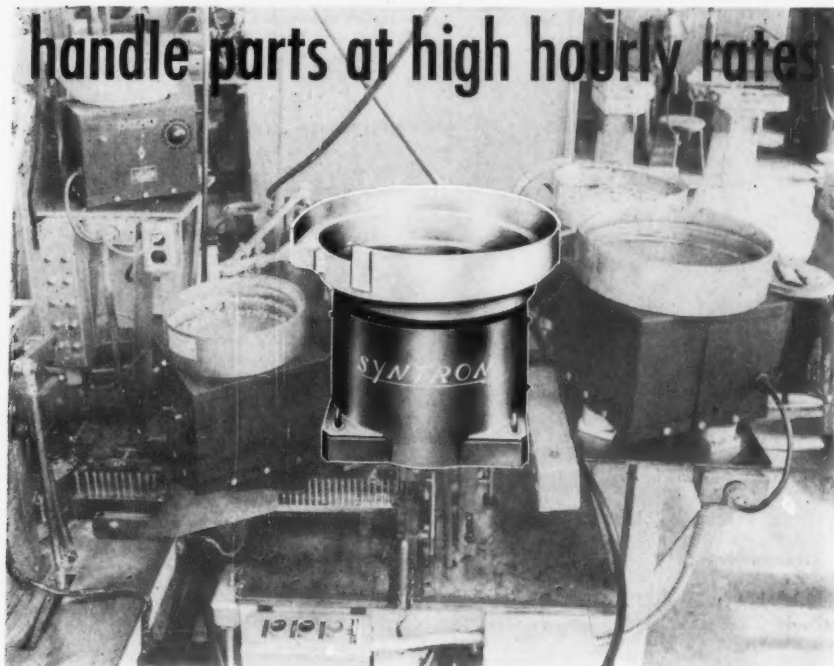
## -K-

Kapp Engineers, H. ....	320
Kenco Mfg. Co. ....	5
Kennametal, Inc. ....	67
Kidde Precision Tool Corp. ....	286

## -L-

Laminated Shim Co., Inc. ....	66
Landis Machine Co. ....	4

**SYNTRON cost-reducing equipment of proven dependability**



***SYNTRON*** Vertical Vibratory

## **PARTS FEEDERS**

... replace manual methods of handling small parts ... handle parts of almost every size, shape and material at high instantly controlled rates to tapping, counting, inspecting, tooling, centerless grinding, stamping machines, and other operations.

SYNTRON Parts Feeders offer dependable, high count, single file feeding of parts. Designed for efficient, dependable service with little or no maintenance.



Write for free literature on SYNTRON Parts Feeders

**SYNTRON COMPANY**

309 Lexington Ave.

*Quality Equipment Since 1921*

Homer City, Penna.

For more data circle 621 on Postpaid Card

Landis Tool Co. ....	7
Lapeer Mfg. Co. ....	310
Latrobe Steel Co. ....	68
LeBlond Machine Tool Co., R. K. ....	38, 39
Leland-Gifford Co. ....	337
Lewthwaite Machine Co., T. H. ....	277
Lexco Engr. & Mfg. Corp. ....	269
Linley Bros. Co. ....	254
Lockformer Co. ....	331
Lodge & Shipley Co. ....	Third Cover
Lucifer Furnaces, Inc. ....	309

## -M-

M.B.I. Export & Import, Ltd. ....	319
Machine Tool Exposition ....	48
Madison-Faessler Tool Co. ....	31
Madison Industries, Inc. ....	95
Mahr Gage Co., Inc. ....	213
Marshall Steel Co. ....	209
Martin Machine Co., J. E. ....	290
Marton Equipment, Inc. ....	279
Mattison Machine Wks. ....	69
McCrosky Tool Corp. ....	197
McGonegal Mfg. Co. ....	287
Metal Cutting Tools, Inc. ....	294
Metallizing Engr. Co., Inc. ....	81
Metallurgical Products Dept. of General Electric Co. ....	41
Micrometrical Mfg. Co. ....	280
Midwest Tool & Engr. Co. ....	313
Miller Fluid Power Div., Flick-Reedy Corp. ....	191
Millers Falls Co. ....	339
Modern Machine Tool Co. ....	92
Moore Special Tool Co., Inc. ....	26
Morse Twist Drill & Machine Co. ....	17
Mummert-Dixon Co. ....	210

## -N-

National Acme Co. ....	44, 45
National Machine Tool Builders Association ....	48
National Twist Drill & Tool Co. ....	35
Newage Industries, Inc. ....	296
Newtools, Inc. ....	306
Nicholson File Co. ....	155
Niagara Cutter Div., Bollier-Damerell, Inc. ....	320
Nielsen, Inc. ....	288
Nielsen Tool & Die Co. ....	300
Nilson Machine Co., A. H. ....	77
Noble & Westbrook Mfg. Co. ....	245
Northern Illinois Machinists ....	276
Northwestern Tools, Inc. ....	207
Norton Co. ....	58, 59, 109
Numberall Stamp & Tool Co. ....	259
Nu-Tangs, Inc. ....	287

## -O-

Oliver Instrument Co. ....	30
O'Neil-Irwin Mfg. Co. ....	177
Opto-Metric Tools, Inc. ....	253
Osborn Mfg. Co. ....	241

## -P-

Pangborn Corp. ....	113
Parker-Hannifin Corp. ....	85
Parks Woodworking Machine Co. ....	317
Peaslee Metal Products, Inc. ....	272
Pedrick Tool & Machine Co. ....	80
Pemco Perforators Co. ....	300
Pines Engr. Co., Inc. ....	64
Pittsburgh Plate Glass Co. ....	292
Pope Mchry. Corp. ....	12
Portage Double-Quick Tool Co. ....	97
Porter Machine Co. ....	300
Power Grip, Inc. ....	264
Pratt & Whitney Co., Inc. ....	302, 303, 304, 305
Precision Tool & Mfg. Co. ....	269
Preis Engraving Machine Co., H. P. ....	267
Procurier Safety Chuck Co. ....	255
Punch Products Corp. ....	312

## -Q-

Queen City Machine Tool Co. ....	156
----------------------------------	-----

## -R-

R-O Mfg. Co. ....	23
Raymond Mfg. Div., Associated Spring Corp. ....	196
Reading Machine Co. ....	299
Reich Mfg. Co., J. R. ....	288
Reid Tool Supply Co. ....	257
Retco Mfg. & Sales ....	320
Retor Developments, Ltd. ....	321
Rice Pump & Machine Co. ....	210
Richards Co., J. A. ....	264
Rico Tool Co. ....	212
Riehle Testing Machines Div., American Machine and Metals, Inc. ....	204
Rivett Lathe & Grinder, Inc. ....	231
Rockford Engineered Products Co. ....	192
Rockwin Mfg. Co. ....	212
Rodgers Hydraulic, Inc. ....	28
Rothfuss Tool Co. ....	295
Rotor Tool Co. ....	215
Rouse & Co., H. B. ....	91
Ruthman Mchry. Co. ....	333

## No other tracer attachment has all these features

Traces from any template (round, flat, wood, metal) or standard product.

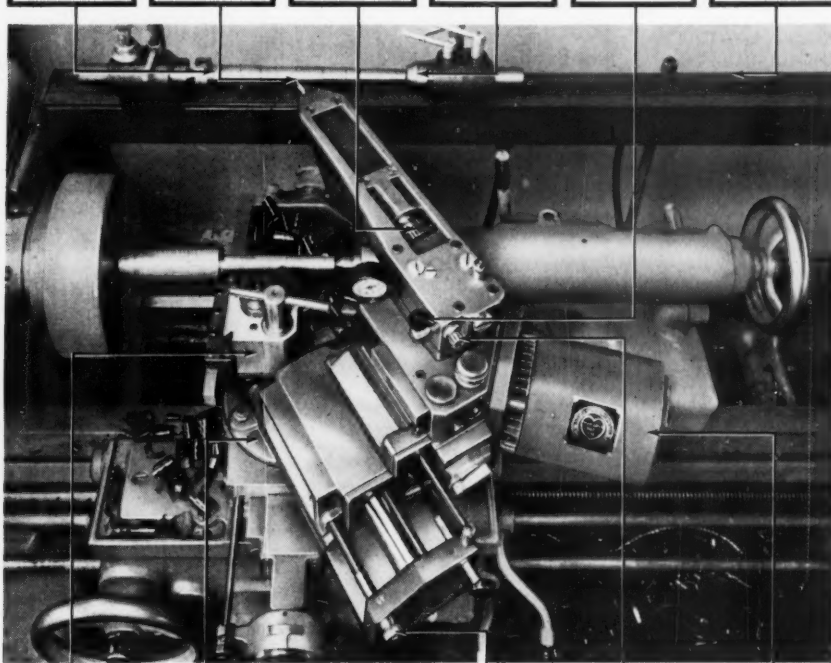
Tracer controls tool in continuous path for smooth, accurate finish.

Micrometer adjusts for cutting over, under or exact size.

Adjustable eccentric on template protects lathe tailstock.

Easy-to-reach control knob initiates or interrupts cycle.

Template rails furnished any length and with brackets to fit any lathe.



Tool post and holders designed for quick change of pre-set tools.

Complete swiveling for turning, boring or internal cutting at any angle.

Does not limit utility of lathe . . . regular turning can be done with tracer installed.

Positive stop locks unit for non-tracing cuts.

Adjustable valve controls feed rate for non-tracing work.

Close-coupled motor and pump eliminates hoses, assures sensitive control.

For far less than you would imagine, you can quickly convert any good lathe for turning multiple diameter shafts or for turning, facing and boring contoured workpieces . . . single pieces or high production. Three sizes to fit any lathe up to 27½" swing and up to 30 horsepower.

*Write for complete information.*



**LELAND-GIFFORD**  
WORCESTER 1, MASSACHUSETTS

**HYDRAULIC LATHE TRACER ATTACHMENT**

For more data circle 622 on Postpaid Card

# -S-

Sales Service Mfg. Co.	290
Sanford Mfg. Corp.	247
Savage Co., W. J.	315
Scherr-Tumico Co.	265
Schupack Supply Co.	338
Scully-Jones & Co.	183
Service Machine Co.	236
Sheffield Corp.	50
Sheldon Machine Co., Inc.	229
Skinner Chuck Co.	163
Smith & Sons, Inc., G. W.	299
Snap-On Tools Corp.	200
Sonnet Tool & Mfg. Co.	256
Sossner Tap & Tool Corp.	108
Spartan Saw Wks., Inc.	293
Spellman Co., R. L.	282
Springfield Machine Tool Co.	42, 43
Standard Electrical Tool Co.	340
Standard Horse Nail Corp.	198
Standard Steel Specialty Co.	283
Standard Tool Co.	82
Stanley Tools	190
Stevens Co., John B.	289

Stocker & Yale, Inc.	257
Strand Flexible Shaft, Inc., N. A.	316
Stuart Oil Co., Ltd., D. A.	199, 201
Sundstrand Corp.	187
Sunnen Products Co.	13
Supreme Keyseat Cutters Co.	294
Supreme Products Corp.	167
Sutton Tool Co.	99
Syntron Co.	335

# -T-

Tap Cartridge Co.	203
Teeter, C. B.	242
Thermo Electric Mfg. Co.	230
Thor Power Tool Co.	175
Threadwell Tap & Die Co.	307
Thriftmaster Products Corp.	174
Tools, Inc.	276
Toolset, Inc.	268
Torrit Mfg. Co.	238
Torsion Balance Co.	315
Trico Fuse Mfg. Co.	186
Twentieth Century Mfg. Co.	273

# -U-

Union Twist Drill Co.	151
U. S. Automatic Box Mchry. Co., Inc.	277
Universal-Cyclops Steel Corp.	73
Universal Engr. Co.	54

# -V-

Valvair Corp.	96
Victor Mchry. Exchange, Inc.	289
Vogel Tool & Die Corp.	185

# -W-

Wade Tool Co.	6
Walker-Turner Div., Rockwell Mfg. Co.	111
Walton Co.	301
Wardwell Mfg. Co.	260
Watts Bros. Tool Wks.	289
Webber Gage Co.	40
Wells Mfg. Corp.	240
Wheelock, Lovejoy & Co.	285
Whistler & Sons, Inc., S. B.	88
Williams & Co., J. H.	61
Wilson Air Collet Closer, Inc.	296
Wilson Mechanical Instrument Div., American Chain & Cable Co., Inc.	193
Wilton Tool Mfg. Co., Inc.	281
Winter Bros. Co.	34
Wisconsin Drill Head Co.	70

## 144 ABRASIVE WHEELS & POINTS

Brand New  
Perfect First  
Quality  
Mounted on 1/4"  
Steel Mandrels

ONLY  
**\$28.50**

Postpaid  
in U.S.A.  
Imported



List value  
\$93.60  
Save  
up to  
\$65.10

## 72 Abrasive Wheels & Points on 1/4 inch steel mandrels \$26.50

Complete In Handy, Sturdy Container At No Extra Cost

If after 10 days you are not fully convinced that this is the greatest wheel and point value in the industry, return the set at no cost or obligation on our part.

Illustrated Free Catalog on Request

**SCHUPACK SUPPLY CO.** DEPT. MS-24  
7331 Cottage Grove Ave. Chicago 19, Illinois  
For more data circle 623 on Postpaid Card



**ANOTHER 1<sup>ST</sup> FROM MILLERS FALLS**

**Watch Out...  
IT BITES!**

**Revolutionary new**

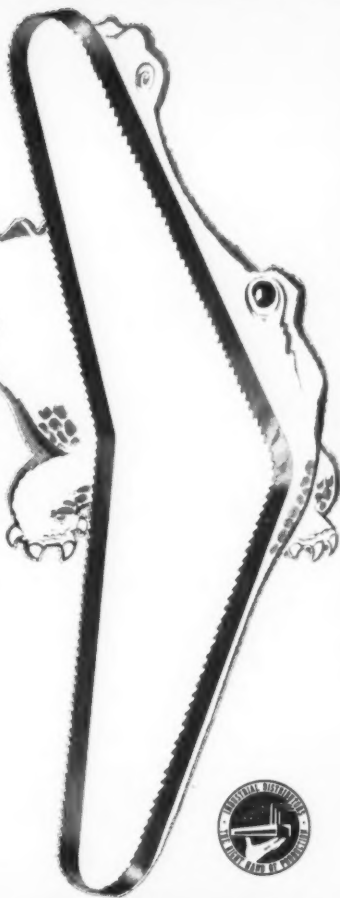
**JET BAND**

**Vanadium Carbide Bandsaw**

**Check these advantages:**

- JET BAND** outlasts . . . outperforms carbon bands 3 to 1 at regular speeds and feeds!
- JET BAND** matches high speed steel band performance — yet costs 25% less!
- JET BAND** steel is an entirely new alloy — specially developed for bandsaw use!
- JET BAND** vanadium carbide is actually harder than a grinding wheel!
- JET BAND** cuts even stainless and high temperature alloys on standard machines!
- JET BAND** is thoroughly proved — backed by over a year of testing in the field!
- JET BAND** has high fatigue resistance!

Write for full information  
**MILLERS FALLS COMPANY**  
Dept. MM-11, Greenfield, Mass.



**MILLERS FALLS  
TOOLS**

SINCE  
1868

HAND TOOLS

PRECISION TOOLS

METAL CUTTING SAWS

ELECTRIC TOOLS

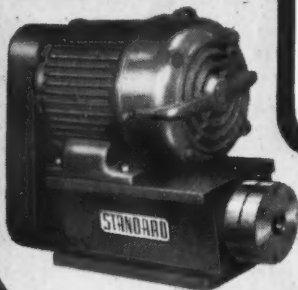
For more data circle 624 on Postpaid Card



No. 4203B with  
Removable Boring Head



No. 4003B  
with  
Mounting Bracket



No. 4407B  
Piggy-Back  
Assembly



No. 4408B with  
Platform for  
Motor Mount

**S**pecify rugged, dependable  
Standard Super Precision Boring  
Spindles. The nation's widest line  
of conventional designs plus custom  
engineering service.

**WRITE FOR CATALOG TODAY!**



No.  
4309B ←

No.  
4204B →



**PRECISION SPINDLE DIVISION**

the **STANDARD** electrical tool co.

2487 RIVER ROAD, CINCINNATI 4, OHIO

For more data circle 625 on Postpaid Card



Since 1912

HALLMARK OF METALWORKING  
THROUGHOUT THE WORLD

# the LONG... and short of it!



## LONG ON SAVINGS!

Why use a 6, 8 or 10-foot shear to cut small pieces? The Lodge & Shipley 24" Speed Shear is big in everything but capacity and prices. It's a heavy duty, quality production type shear, less than \$3000 complete! It quickly repays its low cost in time and labor savings, doing jobs impractical (even impossible) on an oversize shear. Specially designed for the small jobs that tie up big shears, it has a capacity of  $\frac{1}{4}$ " x 24" in mild steel.

The Speed Shear is designed not only for straight shearing with the use of a back gauge but for accurate duplication of straight-side parts without the expense of dies and punch press equipment. It provides fast, efficient cutting—proved in production by leading aircraft, electronic and other manufacturers and fabricators.

At standard speed, the Speed Shear makes 120 strokes per minute; using the non-repeat method, up to 60 strokes per minute. All adjustments are in front, including the back gauge, which can be adjusted to 1/126th of an inch. The work table is equipped for convenient notching and slitting.

If you're interested in shear savings, write Dept. SS-2, The Lodge & Shipley Company, 3058 Colerain Ave., Cincinnati 25, Ohio.

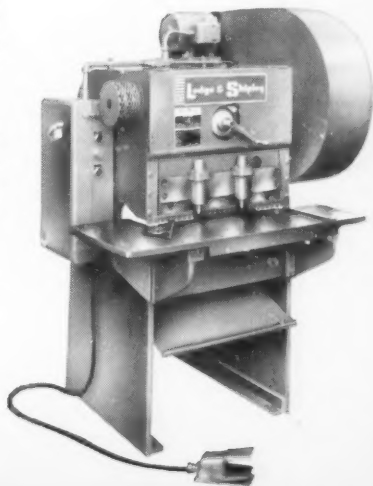
your Lodge-ical choice

## **Lodge & Shipley**

For more data circle 303 on Postpaid Card

## SHORT ON FLOOR SPACE!

height overall.....72"  
width overall.....50"  
depth overall.....50"  
table height.....36"  
shipping weight...2,600 lbs.



# HIGHER PRE-LOADS . . . LESS INDENTATION WITH H-K'S NEW 1960 SERIES FORGED SOCKET HEAD CAP SCREWS

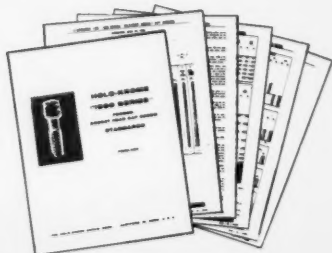
- LOAD DISTRIBUTED OVER WIDER BEARING SURFACE
- HIGHER PRE-LOADS
- INDENTATION UNDER HEAD ELIMINATED
- SMALLER, FEWER FASTENERS REQUIRED
- INCREASED VIBRATION RESISTANCE
- ENLARGED SOCKET IN MANY SIZES
- NO INCREASE IN PRICE

## HOLO-KROME SOCKET SCREWS

THE HOLO-KROME SCREW CORPORATION • HARTFORD 10, CONN.

SOLD ONLY THROUGH AUTHORIZED DISTRIBUTORS

Send for your FREE copy of H-K's complete dimensional standard for the new 1960 SERIES. Ask for Form CSN.



For more data circle 304 on Postpaid Card

